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concrete construction

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CONCRETE'S ARMY

There are many reasons for the rapid and dramatic progress which concrete is making today in every branch of construction. Behind all this progress there is a veritable army of organizations which devote all or a major part of their means and energies to the single task of improving the product and extending its uses.

It would be a formidable task to list them all in the space available here, but to document our point it may be worthwhile to mention some of the more prominent ones. At the top of any such list belongs the American Concrete Institute, headquartered in Detroit, which for more than half a century has spearheaded technical progress in the great industry it serves. The Portland Cement Association, established in 1916 with main offices in Chicago, has a formidable budget, a small army of able engineers, chemists and technicians, and one of the finest research laboratories in the world—all singlemindedly dedicated to improving and extending the uses of concrete and portland cement.

For the past thirty years the development and improvement of ready mixed concrete have been the special concern of the National Ready Mixed Concrete Association, headquartered in Washington, D. C. This group carries on a constant program of research and test work which has yielded untold benefits to users of concrete. The Prestressed Concrete Institute is making its influence felt more and more in this important new field. The manufacturers of aggregates, through their several national associations, have also made notable contributions to the cause of concrete through both research and promotion. Some of the prominent groups in this field are the National Sand and Gravel Association, the National Crushed Stone Association, the National Slag Association, and (more recently) a number of national associations formed by manufacturers of various types of lightweight aggregate.

The manufacturers of equipment and tools and chemical additives related to concrete have all played their part in the furtherance of the cause, as have also the many branches of the United States Government which are concerned with concrete. In total all of the groups we have mentioned, plus as many more which we are certain to have omitted, constitute what we have chosen to call "concrete's army." It is undoubtedly one of the most potent and effective forces ever concentrated on a single material.

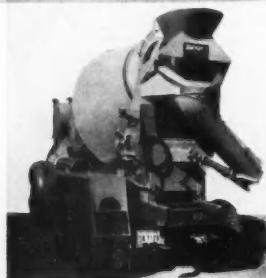
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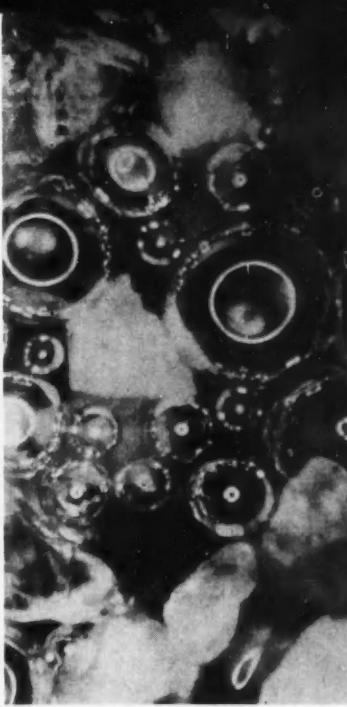


Photo courtesy Dewey and Almy Chemical Co.

This photomicrograph of plastic air entrained concrete suggests how minute bubbles of air function as very small ball bearings which make the concrete more workable than a non-air entrained mix.

EVERYONE LIKES A SHORT CUT. It's just plain tempting. That's why men once searched for a means of transforming base metals into gold. It seemed so much easier to make it than earn it.

In the area of concrete construction, where much depends on know-how, patience and careful workmanship, it was only natural that short cuts should be offered in the form of admixtures. Of all the many products put on the market in the last few decades, one has risen head and shoulders above the others in its effectiveness. It is, of course, the air entraining agent.

Even this admixture is no wonder-worker, however. It is not intended to replace correct practices in mix design or concreting. Rather, it complements these quality concrete rules to produce a finished product that will be more durable and satisfactory to all concerned. Let's take a closer look at this pre-eminent admixture.

what air does

The introduction of air into concrete mixes has some pronounced effects on the characteristics of both the plastic and the hardened concrete.

In fresh concrete, the tiny air bubbles act as a lubricating element in the mix which improves its work-

ability and increases its slump. Also, in a sense, the bubbles can be considered a third aggregate. Because of their small size, the bubbles act as fines, thereby cutting down the amount of sand needed. Because air entrainment affords increased slump, it is possible to decrease the amount of water to get higher strengths without affecting workability. Less water means less drying shrinkage—always a desirable feature. Bleeding in concrete is cut approximately in half by entrained air. This reduces considerably the adverse effects of a higher water/cement ratio at the surface of slabs and of laitance forming on concrete surfaces. Air also produces "stickier," more cohesive concrete; as a result, less segregation is experienced and more attractive surfaces are achieved.

In hardened concrete, the outstanding attributes of air entrainment are the enhanced weatherability and resistance to scaling afforded. Damage to concrete by freezing and thawing is caused by disruption of the cement paste through formation of ice in capillaries. Even under laboratory conditions it is not possible to completely fill these voids with ice. However, when ice occurs in the voids, it forces the remaining water under pressure

against the capillary walls, thereby breaking down the hardened paste. The air bubbles in air entrained concrete act as a safety valve by giving the water a place in which to flow. When thawing occurs, the compressed air in the bubbles forces the water back into the capillaries, thereby freeing the bubbles for use again during the next freeze.

Test sections of pavement in New York state built with and without air entrainment showed dramatically the value of air in exposed work. After fourteen years of exposure to the rigors of this northern climate and frequent salting, the non-air entrained concrete was badly scaled; in some cases 100 per cent of the surface was affected. The air entrained pavement, laid next to the other sections, showed absolutely no scaling or D-cracking.

During October 1942, 94 columns cast of concrete made with several types of cements and varying amounts of air entrainment were set on the exposure rack at Treat Island, Maine. At the end of one year (188 freeze-thaw cycles) 10 percent of the columns had failed; none were air entrained concrete specimens. After five years of exposure (663 freeze-thaw cycles) 26 percent of the columns had

Air Entrainment and Concrete

**Some things you should know
about a combination that assures
longer-lasting and more attractive concrete.**

Numerical Scale Ratings

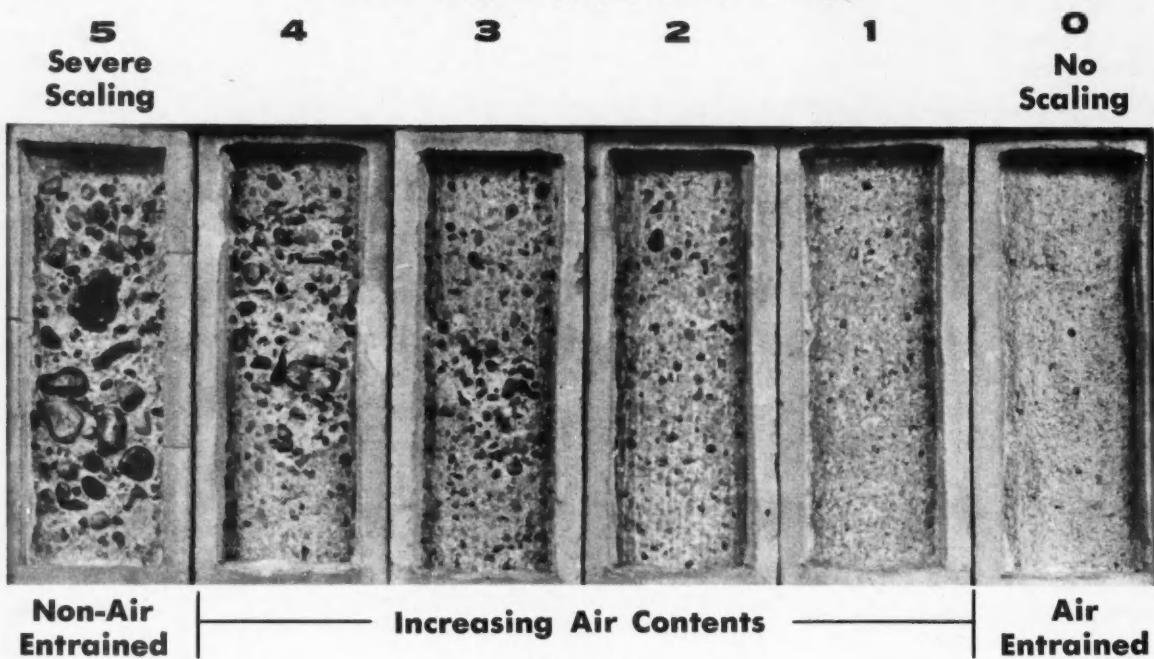


Figure 1

failed; again, no air entrained specimens had failed.

Sulphate resistance is also heightened by the use of air entraining agents. Although low water/cement ratios and the use of Type II or V cements are of primary importance in lessening the effects of sulphate attack on concrete, a glance at Figure 1 will illustrate that air entrainment is helpful—especially when higher water/cement ratios are used.

Time and again, in laboratories and in the field, tests have unequivocally shown that air entrainment brings about a tremendous increase in the durability of concrete.

how to entrain air

As was mentioned earlier, certain alterations in mix design are needed when air is added. The air should be considered a fifth ingredient when proportioning the mix. The first matter to be considered is the percentage of air desired (see table).

Tests have pointed out that improvement in weatherability is experienced starting at approximately two percent air. The lowest percentage usually specified, however, is three. At the other extreme, the maximum air content called for is usually six percent. In specifications air content is usually stated as a given figure plus or minus a certain percentage. It is

not feasible to hold the percentage constant because air content is affected by so many factors (including maximum size of coarse aggregate, amount of air entraining agent, type and gradation of aggregate, hardness of water, length and means of mixing, brand of cement, concrete temperature, etc.) A common specification allows for variation of plus or minus 1½ percent.

Air can be entrained in concrete by two methods: air entraining cements or air entraining agents. Air entraining materials include such products as natural wood resins, animal or vegetable fats, wetting agents and water soluble soaps of certain acids. The material can be interground with the cement clinker or it may be introduced directly before mixing. The material, when combined with the other concrete constituents, acts as a foaming agent. By lowering the surface tension of the water, a stable foam is generated which results in the forma-

tion of microscopic air voids. Laboratory calculations indicate that from 400 to 600 billion air bubbles are entrained in a single cubic yard of concrete with an air content in the range of three to six percent!

Choosing the amount and means by which air is to be added to the mix depends on a great number of variables. (In some areas, the natural occurring fine aggregate contains organisms which add four to five percent "accidental" air to the mix.) In general, it is easiest and most profitable to consult with your ready mix supplier. He is familiar with aggregates, cements and other pertinent factors in your area and will be able to deliver an air entrained concrete that is consistent and best suited to the job at hand without headaches for you.

working with it

As can be judged from a listing of profound effects produced by the inclusion of air in a mix, it is neces-

If Maximum Coarse Aggregate Is . . .

1½- to 2½-inches

¾- to 1-inch

⅜- to ½-inch

Specify

5 percent air ± 1½

6 percent air ± 1½

8 percent air ± 1½

sary to alter somewhat the manner in which the resulting concrete is handled. Contractors who are unfamiliar with these differences sometimes blame poor performance on the use of air. In reality, air entrainment will produce significantly better looking, longer lasting concrete when it is handled correctly.

When the ready mix truck pulls in with a load of air entrained concrete it is especially important that forms be ready to receive it. Although opinions vary somewhat, it is generally conceded that the amount of intentionally entrained air increases noticeably with mixing during the first five minutes. It then remains relatively constant for about five additional minutes, after which time the air content decreases gradually. After forty to sixty minutes of mixing the percentage of air will be about equal that at one minute of mixing. It is apparent, therefore, that a contractor must be ready to receive ready mix when it is delivered if he wishes to ensure a constant percentage of air. Since high temperatures tend to dispel air from the mix, prolonged mixing during the summer months would also tend to result in variations in air content. The type of mixer used causes differences in the amount of air entrained; but with ready mix, this problem is avoided by the close control afforded by truck mixers.

Since air entrained concrete is more cohesive and workable, there is not as much danger of segregation and air pockets. Accordingly, vibration need not be prolonged. Vibration time with air entrained mixes should be shortened and kept reasonably constant since it tends to dispel the air. A normal amount of vibration (about one-half minute) reduces the initial air content about ten percent. When vibrated one minute, the air content is lowered fifteen to twenty percent. In addition, internal vibration reduces air more than external vibration. Slump should also be watched since air content increases as the slump increases.

Appearance-wise, air entrained concrete has an unusually creamy, fatty look. This, coupled with the virtual absence of bleeding, sometimes results in incorrect handling of the concrete. In structural work, difficulties are not usually experienced because the mix easily assumes even intricate shapes. It also flows easily around closely spaced reinforcing bars. In slabs re-

quiring finishing, however, a change of technique is required.

When working with non-air entrained concrete, it is customary to wait until the water at the surface of the slab (caused by bleeding) has evaporated before finishing operations are begun. This classic approach can cause troubles if applied to air entrained concrete slabwork because, as has been stated, it experiences little bleeding. Often workers have waited for bleeding to appear until the concrete has set up to an extent that makes finishing difficult or impossible. Generally speaking, finishing should always commence sooner with air entrained concrete. Early finishing is even more important when the air temperature is high, humidity is low and/or a wind is blowing. Finishing need not be carried on as long as with ordinary concrete. All this means that air entrained concrete can be protected and curing can start earlier than is the case with ordinary concrete.

Sometimes there is a tendency for air entrained concrete pavement surfaces to tear when using mechanical screeds or finishing machines. This can be corrected by shortening the amount of forward motion per transverse stroke or by maintaining a 2½-to 3-inch slump. In addition, a longitudinal float as well as a transverse screed should be used. Transverse finishing machine screeds should be adjusted for a lower tilt than is generally used. Usually $\frac{1}{8}$ inch backward tilt or lift of the front screed cutting edge and a level rear screed prove most satisfactory with air entrained concrete pavements. Concrete pushed ahead of the front screed should have a depth of from three to six inches during the first pass of the finishing machine. When hand finishing, better results will usually be encountered with a wood, rather than metal, float.

special applications

Purposefully entrained air in concrete has been found to be of value in a number of special applications. In most cases, its excellent weathering qualities and increased cohesiveness render it decidedly superior to ordinary concrete.

lightweight concrete

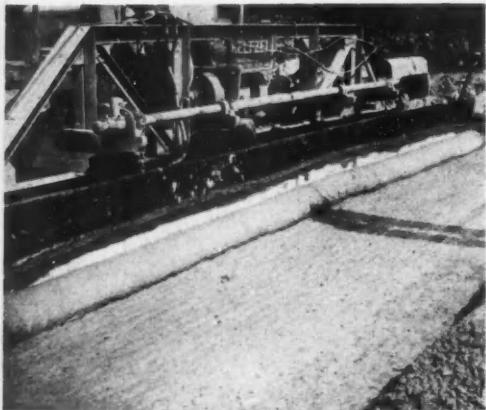
Lightweight aggregate concretes have been enjoying mounting acceptance in recent years. As concrete buildings rise higher and spans grow longer, weight reduction has become increasingly important. Almost all lightweight aggregates are manufactured. They are formed by heating clay, shale, slag, slate, mica and pumice materials to a point that is below fusion but that is sufficient to drive off water explosively, thus effectively expanding the aggregate.

The resulting material is lightweight; but it is also angular, porous and cellular—all of which result in harsh, unworkable concretes. The quantity of water of convenience (that needed beyond the amount necessary for cement hydration) required in lightweight aggregate concrete work is usually considerable. This means a high shrinkage rate, laitance because of considerable bleeding and lower strengths or higher cement contents. Air entrainment reduces the amount of water needed for handling by producing a creamier mix. This reduction amounts to as much as forty gallons per cubic yard of lightweight concrete. Thus compressive strength, homogeneity and impermeability are all greatly improved. Since the air bubbles have no weight, unit weight is decreased and insulating value is increased. It is obvious that lightweight aggregate concretes are benefited considerably by air entrainment.

The amount of air to be entrained

Another dramatic illustration of how concrete pavements are protected by air entrainment. The pavement shown here is at a busy street intersection subjected to heavy and frequent applications of salt. The concrete in the unscaled portion to the left of the joint is identical to the heavily scaled concrete to the right except for the inclusion of entrained air.





The roll of concrete ahead of this finishing machine, making its second pass, demonstrates the cohesiveness and workability which are typical of air entrained concrete.

depends upon the intended use and desired weight of the concrete. Structural concretes should have less air than insulating types. Amount of air is usually inversely proportional to the weight of the concrete—the lighter the concrete, the more air is required.

Unfortunately, some properties of lightweight aggregates conspire against entrainment of air. The great angularity of lightweight aggregates reduces the number of air bubbles entrained because the sharp points and edges break the bubbles while mixing is taking place. Also, aggregate angularity results in large void spaces. The ensuing large air bubbles break down easily or rise to the surface of the concrete. Ordinarily this means that greater quantities of air entraining admixtures must be used in lightweight concretes. Unfortunately, if very large amounts are used, the organic makeup of the admixtures might result in delayed sets or lowered strength, especially in winter. However, powerful air entraining agents that largely eliminate these troubles have been created especially for lightweight aggregate concrete work.

tremie concrete

Tremie concrete (concrete placed underwater by gravity feed through a vertical pipe) has been in use for over a century as a means of placing concrete under difficult conditions—for cofferdams, caissons and underwater foundations and in certain hard-to-reach reinforced concrete situations. It offers the advantages of easy and

rapid placement, elimination of dewatering, perfect curing environment and reduction of honeycombing.

Along with these advantages come a number of drawbacks, including nonuniformity, high slumps necessary for flow and high incidence of laitance. In addition, high cement contents are often required. The use of air entrainment has been found to reduce all of these complaints. The greater cohesiveness and workability of air entrained concrete results in greater uniformity and less segregation. Slumps can be reduced and the formation of laitance is greatly retarded. Since the cement content can be reduced, internal heat caused by hydration is lessened. Also, gentler slopes are the rule, thanks to the high flowability of air entrained concrete.

floors

Air entrainment is often omitted in floor slab construction because this type of flat work is not ordinarily exposed to weathering. However, as we have seen, resistance to weathering is only one of many advantages of air entrained concrete.

In slab-on-grade work in localities where sulphate attack is likely to occur, air entrainment can help minimize or entirely eliminate deterioration of the concrete. Since segregation is reduced, it is easier to obtain surfaces able to resist the abrasion of heavy traffic. Better workability can be had with less water resulting in less finishing and higher strength slabs. On occasion, inside floor slabs are subjected to freezing and thawing because of delay in the completion of other portions of a structure. In such cases, of course, the margin of safety provided by air entrainment is most desirable. It should also be remembered that on large jobs, there is always the human element to be considered when calling for concrete with and without air. Non-air entrained concrete can quite readily be used inadvertently for exterior work, or because workers are not ready to use it in slabwork at the time it is delivered.

The only exception to this is in mixes for toppings of heavy-duty two-course floors. Since these toppings are of such low water/cement ratios and contain such high quality aggregates, air entrainment is not required. In general, however, it should be specified for all one-course floors and for the bases of two-course slabs.

colored concrete

The last decade has seen a considerable increase in the use of exposed concrete as an architectural feature of buildings. Right along with this trend there has been an increase in the use of coloring agents in concrete. Unfortunately, field experience and laboratory tests have shown that certain coloring agents (especially carbon black and black iron oxide) result in a lowering of the weatherability of the concrete.

It appears that this adverse effect is a direct result of the action of coloring agents in reducing the air content of fresh mixes. As little as three percent by weight of a coloring material in a mix containing five percent air results in a reduction in air content to less than one-half percent. When sufficient air entraining agent is used to restore an air content of from three to six percent, colored concrete resists the action of freezing and thawing and surface scaling to the same extent as non-colored air entrained mixes. Many producers of concrete coloring agents now grind an air entraining agent in with their product.

air entrained concrete strength

"But air bubbles don't have any strength!" And so starts many a discussion on the question of whether air entrainment has an adverse effect on concrete strength. In reality, this question is now resolved with a high degree of certainty to a simple yes and no.

The answer is yes if you refer to identical mixes except for inclusion of entrained air in one. Assuming a concrete containing at least six sacks of cement per cubic yard and a maximum coarse aggregate size of 1½ to 2 inches, each percent of increase in air content will result in a reduction in flexural strength of two to three percent and a lowering of three to four percent in compressive strength. The richer the mix, the greater will be the reduction in strength by use of air entrainment.

The answer is no, however, if proper adjustment of the mix is made. Because air entrainment greatly improves the workability of concrete, the mix design should be altered by reducing the amount of sand and water. If advantage is taken of this characteristic, strengths will be equal to non-air entrained concretes or, in some cases, even higher. Experiments have

indicated that air entrained mixes are also somewhat less susceptible to the adverse effects of improper curing.

Air entrained mixes are subject to the water/cement law in the same manner as are their non-air entrained counterparts; any desired strength possible with ordinary concrete can be achieved by observing the usual rules of quality concrete.

measuring air content

A number of tests have been devised for measuring the air content of concrete. However, all are based on one of the following three principles: gravimetric, volumetric or pressure.

The gravimetric method was the first test for air content devised. It consists of obtaining the sum of the absolute volumes of ingredients in a known volume of concrete and subtracting it from the measured gross volume. It was found to be slow, expensive and of questionable accuracy.

The volumetric method simply tests fresh concretes containing any type of aggregate by measuring directly the volume of entrained air. A representative sample of the concrete is chosen, placed in the testing apparatus, the air is expelled from the concrete by manual methods and a direct reading is made. This technique can also be employed using only mortar (cement, sand and water.)

The pressure principle measures air content indirectly by noting the volume change concrete undergoes when subjected to a given pressure. Since the only gas in concrete is air, it can be measured by applying a pressure and computing the amount that the

concrete contracts. Either water or air can be used to apply the pressure, but water is most commonly used. With this test, a correction must be made for the porosity of the aggregate.

Testing the air content of lightweight aggregate concretes by the pressure method calls for special precautions since it measures the air in the aggregate as well as the cement paste. In addition, compression may cause the collapse of air cells in certain soft expanded aggregates. When the mix is excessively harsh, high particle interference and bridging sometimes cause compression of the concrete which is not in proportion to the applied pressure. The picnometer or rolling method is generally impractical with lightweight aggregate concretes because the air contents are higher than the calibration provided.

reducing air contents

Too much of anything is bad. Use of air entrainment can result in a multitude of beneficial effects. But too much can seriously undermine strengths without adding increased durability.

Very little weatherability is gained by air contents over four percent, but six percent air does offer better control of segregation and water gain. Mixes with air contents of up to twelve percent still exhibit the same resistance to weathering as those in the four to six percent air range. The breaking point appears to occur at slightly over twelve percent when durability begins to decrease markedly.

Although durability is not hurt by such high air contents, concrete strengths are greatly lowered when

air rises above seven or eight percent. When abnormally high air contents are experienced or when non-air entrained concrete is required and only air entraining cements are available, there are materials available to remove air from fresh concrete.

Tributyl phosphate is an odorless chemical available from most chemical manufacturers. Ordinarily ten to fifteen cubic centimeters per cubic yard are required to remove all air from a typical mix. Z-ethyl hexanol, also commonly available, will remove all air from most mixes by the addition of approximately ten cubic centimeters per cubic yard. Experimentation will be required to determine the exact amount needed to achieve the desired reduction in air content with specific batches in the field.

here to stay

Air entrainment is with us for good. It has proved its value in so many respects, over such a wide range of uses and for so many years that its future is secure. It is a development in concrete technology that has enhanced the reputation of concrete construction immeasurably by providing at little or no extra cost or effort a material that is more durable and attractive.

END

Readers who would like to have additional information on the subject discussed in the foregoing article may request it by mailing in one of the reader service forms in the back of this issue.

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THIS ISSUE: OVER 31,000 COPIES MAILED

Subscriptions are purchased in groups by almost 400 of the foremost producers of ready mixed concrete throughout the United States and Canada who supply us mailing lists of their customers and prospects among contractors, engineers and architects. This program is carried out under a rigidly maintained policy of eliminating duplicate mailings to individuals.

Individual subscriptions at the rate of \$5.00 per year, \$9.00 for 2 years (U.S.A.); \$10.00 per year (Foreign). Single copies \$1.00. Subscription order must be accompanied by check.

This awe-inspiring creation in concrete was part of the Belgian civil engineering exhibit. The 260-foot long beak, a reversed-A reinforced concrete beam, cantilevered from a triangular-based pier, was counterbalanced by a shell-roof cantilevered platform. A light steel and concrete footbridge was suspended from the beak by prestressed steel hangers.



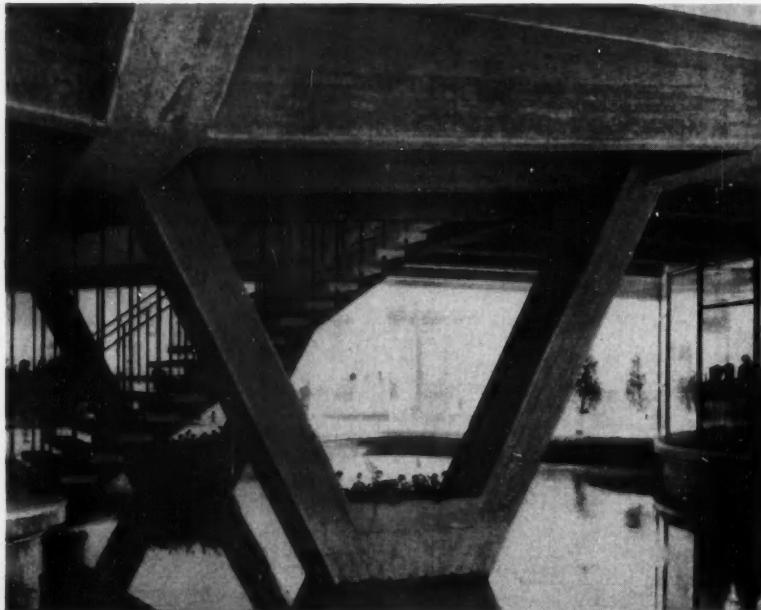
CONCRETE AT BRUSSELS

CONCRETE CONSTRUCTION MEN everywhere are bound to share an interest and a sense of pride in the astonishingly dramatic effects which are now being achieved with concrete throughout the civilized world. Nowhere has the point been more eloquently made than at the Brussels Exhibition of 1958, which might well have caused the uninformed to suspect that the major purpose of the affair was to demonstrate the vast possibilities of concrete.

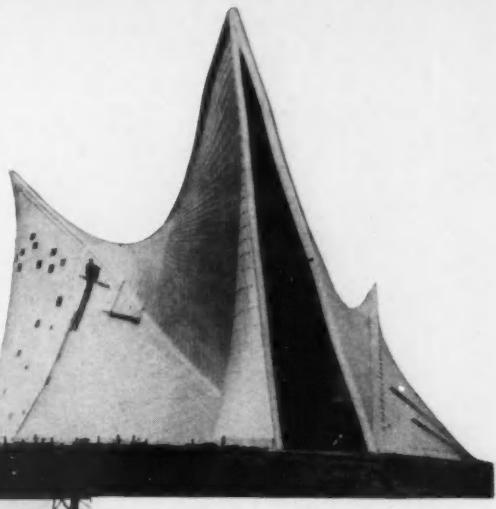
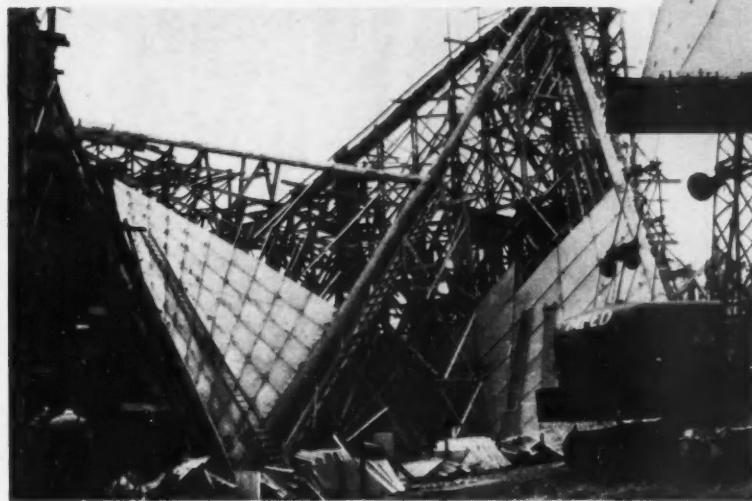
While most of the readers of this publication will not have much occasion to deal with such extreme and flamboyant concrete structures, we believe there should be wide interest in the pictures we have brought together on these pages. They support, quite eloquently we believe, our constantly reiterated theme that the real age of concrete construction is only just now beginning to unfold. The brief captions which accompany each picture are designed to answer only the simplest and most obvious questions concerning the various structures. Concrete Construction Magazine is indebted to the Cement and Concrete Association of England for the excellent photographs.

FILE: Architectural

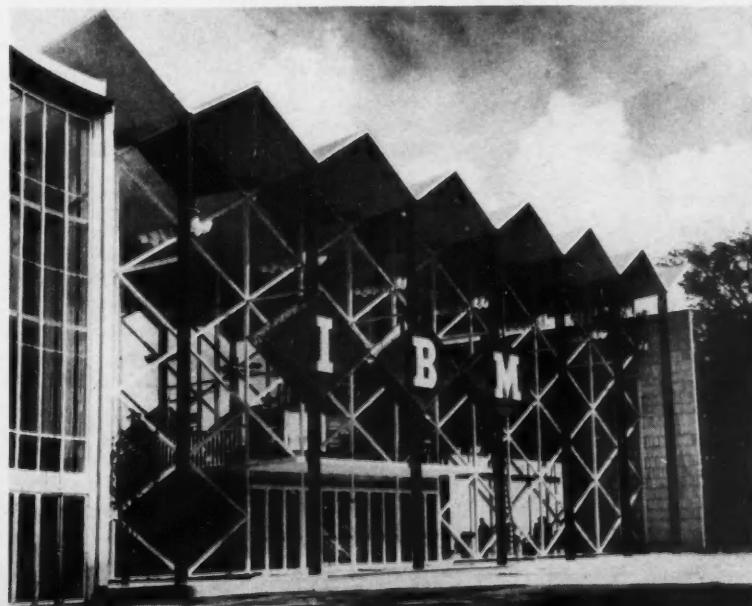
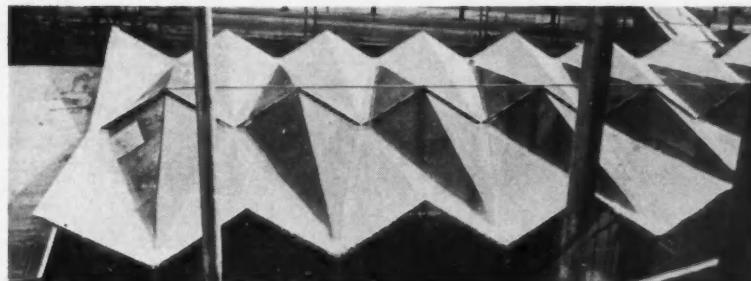
In the Argentine Pavilion, bush hammered pilotes (heavy columns) rose from an ornamental pool. Here and elsewhere throughout the exhibition reinforced concrete was found to have advantages over other materials on the basis of both cost and speed, notwithstanding its obvious disadvantages from the standpoint of demolition.



Perhaps the most daring design was the Philips pavilion, a prestressed concrete structure made up of twelve interwoven hyperbolic paraboloids. The 2-inch thick shells for the walls were precast on a sand bed adjacent to the building site, then erected on a framework of timber laths arranged on the lines of the generators of the hyperbolic paraboloids, as shown in the construction view below. All of the trapezoidal pieces were finally bound together by prestressing wires.



LOWER LEFT: Although the main structure of the IBM pavilion was of glass and steel, the designers turned to concrete for the striking roof detail. The photos show the roof under construction, as well as the completed building. The 4-inch thick concrete was cast in place as a series of interlocking triangular shapes, forming a concertina edge to the eaves and tapering to the center.



Even this quaint sculptured "spectator" in the Dutch exhibit was cast in concrete.



While much of Pittsburgh lies buried beneath a blanket of snow, this walkway in Mellon Square Park is clear and dry. Hot water, circulated through wrought iron pipe coils

which are embedded in the sidewalk, warms the concrete, which in turn warms the walkway. Snowflakes melt and evaporate as fast as they touch the sidewalk.

Some things you will want to know about a convenience that many people no longer regard as a luxury. There's

an important "plus" involved for the concrete profession, too, as a result of the increasing popularity of . . .

SNOW MELTING SYSTEMS*

How do you install a snow melting system? What equipment and materials are needed? What advantages are derived?

Basically, the principle of automatic snow removal is to place heat beneath the surface of an area to be cleared by circulating heated glycol solution or light oil through a network of pipe embedded in or below a concrete slab.

The mixture of water and ethylene glycol based anti-freeze is to prevent any possible freezing of the solution while it is in the pipe.

The medium is heated in a boiler or heat exchanger and circulated through the piping system by means of a pump. The advantages of using ethylene glycol are lower viscosity, which results in lower pumping costs, and better heat transfer. Light oil has lower initial costs, and lessens

the danger of sludge deposits forming in the heat exchanger tubes.

The first steps in the installation of a snow melting system is to lay a fill of either crushed stone, washed gravel or similar materials. This will provide drainage and protect the coils from ground moisture and harmful salts.

placing concrete

After the fill is laid, concrete is placed over the subgrade and allowed to harden. The snow melting coils are placed on this slab, after which another layer of concrete is placed to completely bury the coils.

Some contractors prefer the "one pour" operation. This is accomplished by setting chairs on the subgrade to elevate the snow melting coils. Once the entire system is suspended the concrete is placed, completely embedding the snow melting system in one operation.

It is generally recommended that 2½ inches of concrete

(total slab thickness) be a minimum cover. Good concrete practice calls for a minimum slab thickness of 4 inches for sidewalks, 5 inches for residential driveways and light load areas, and 6 to 8 inches or more in heavier loading areas, highways, etc.

The piping should be fully embedded in concrete with a minimum of 1 inch between the bottom of the pipe and the gravel fill.

accelerate hardening

During the winter months, calcium chloride is often added to concrete to accelerate its hardening or to produce higher than normal strength at early periods. This practice is not recommended for sidewalks employing snow melting systems. It is suggested that in this particular application of concrete, high early strength be obtained by other means.

For snow melting installations during cold weather, it is recommended that shelter and heating facilities be adequate to maintain normal concrete—immediately after installation—at 70 degrees F. for three days or 50 degrees F. for five days; or to maintain high early strength concrete at 70 degrees F. for two days or 50 degrees F. for three days.

pipe selection

The kind of piping used for snow melting is most important. Repairing or replacing a failed pipe section calls for ripping up and then replacing large portions of the concrete slab. Failures in snow melting systems are difficult to locate with accuracy, and needless to say, the operation is always quite costly.

Pipe for snow melting systems therefore must possess optimum corrosion resistance. It should also have considerable strength with an ability to resist in-service fatigue stresses and physical abuse during installation.

The coefficients of expansion of the metal and of the concrete in which the pipe coils are to be embedded should be about equal, and the pipe should be easy to thread, weld and bend. The expansion coefficient similarity minimizes hairline slab cracking. Unequal expansion will crack the concrete unless special provision is made to eliminate the bond between the pipe and the concrete. This cannot be done without jacking up installation costs and reducing the rate of heat transfer.

Wrought iron pipe meets all of the above mentioned piping requirements. In fact, wrought iron pipe was used in the first snow melting system in 1925 and has been selected for most of the important installations made since then.

A two-component material—pure iron base metal and iron silicate—wrought iron has excellent mechanical and physical properties for use in snow melting systems. Microscopic inspection shows wrought iron has over 250,000 glasslike silicate fibers per cross-sectional square inch. Each of these fibers is a barrier to corrosion. When corrosion attacks and encounters these non-rusting glass-like fibers, the fibers force it to disperse over the surface of the metal. A dense, tight, protective layer forms over the metal, stopping further penetration.

flow patterns

There are three types of flow patterns used in designing snow melting systems: sinuous coils, grid, and combination grid and continuous coil patterns.



Workmen cast a 3-inch topping of concrete over $\frac{3}{4}$ -inch wrought iron snow melting coils placed on a 5-inch structural slab.

A sinuous coil is a long piece of pipe bent so as to cover the area with parallel runs of pipe on the proper centers. Where the space is irregular, the coil may be in any shape which will space the pipe so that a maximum distance of 18 inches exists between any two runs.

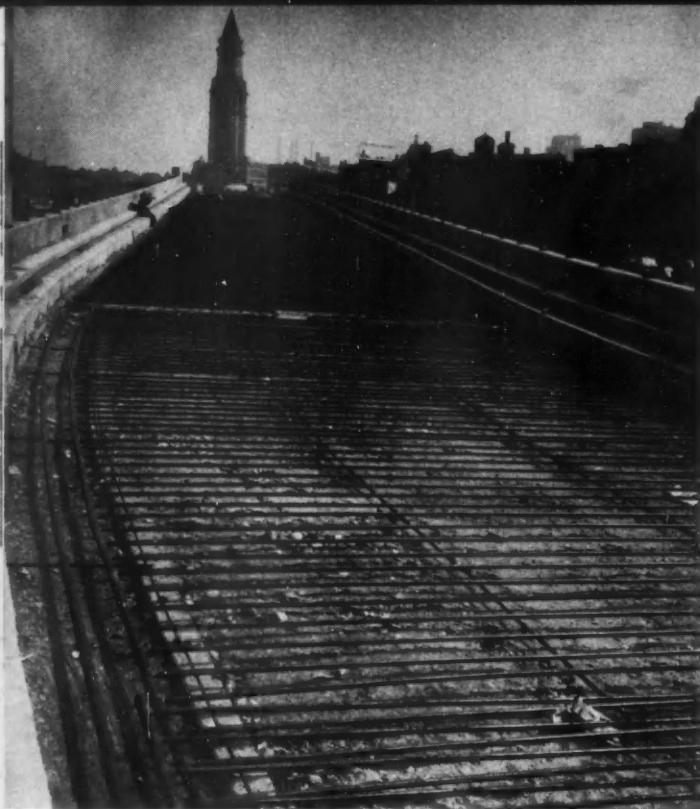
A grid consists of a number of parallel runs of pipe, the ends of which are welded into larger pieces of pipe, or headers, usually placed at right angles to the runs so that the flow will be into the header, through the parallel runs, and out through the other header. It is necessary that the supply and return line connections to these headers be at diagonally opposite points to obtain an equal flow through all runs. Combination grid and continuous coil type installation consists of coils of three or more runs into headers.

Most snow melting designs are based on a melting rate of 1 inch of snow per hour and/or a slab output of 100 Btu per hour per square foot. Design, of course, must be based on the snowfall of each particular area. Most installations use 1-inch pipe on 12-inch centers, or 1 $\frac{1}{4}$ -inch pipe laid on 12-inch centers or 14-inch centers.

However, there are several existing snow melting systems employing 1 $\frac{1}{4}$ -inch on 28-inch centers, 1 $\frac{1}{2}$ -inch on 12-inch centers and 2-inch on 48-inch centers. The 1 $\frac{1}{4}$ -inch pipe on 28-inch centers is considered to be too widely spaced, since it takes several hours for such a system to completely clear an area of snow and ice.

Computing the cost per square foot of the surface area is the most common means of comparing and evaluating costs. The type of construction, labor costs, materials, experience of the contractors, etc., all require consideration. The following are some worthwhile general rules to keep in mind:

1. Use large grids instead of sinuous coils if large areas are to be snow melted.
2. The larger the snow melting system, the lower the cost on a unit basis.



The world's largest snow melting system—Boston Aerial Highway—employs a grid flow pattern. The 1-inch wrought iron pipe was laid on 12-inch centers and extends anywhere from 22 to 50 feet across the roadway.

3. No complicated or expensive control system is needed.
4. No insulation is needed beneath the slab.
5. A system designed to melt 1 inch of snow per hour is adequate for most areas.

Snow melting systems have great appeal in an era when there is so much emphasis on convenience and labor saving, and the smart contractor can trade on this fact by pointing out some of the advantages. The obvious one, of course, is automatic snow and ice removal without manual labor, plows and snow loading machines. Paved surfaces are quickly dried after rain or snow falls, thus forestalling the tracking of dirt into lobbies, stores and homes.

The prevention of injuries to employees, customers and the general public is perhaps one of the most eloquent arguments for greater use of snow melting systems in the years ahead, especially with the current trend for judges and juries to grant exorbitant damages. Perhaps, however, from the purely selfish standpoint of the concrete industry itself, the greatest appeal is the elimination of the use of snow-melting chemicals which are injurious to concrete. This consideration alone should prompt concrete contractors to promote wider use of snow melting systems with wholehearted enthusiasm.

END

Readers who would like to have additional information on the subject discussed in the foregoing article may request it by mailing in one of the reader service forms in the back in this issue.

letters to the editor

ready mix—1909

Sir:

Since writing to you about the portable mixer used in Sheridan, Wyoming in 1909 I have received from the *Sheridan Press* the story just as it appeared in the newspaper for April 2, 1909:

Cornwall's portable concrete mixer, of which The Post gave a detailed description some weeks ago, is now at work on the foundation for Stevenson & Company's new automobile garage building, corner of Gould Street and Grinnell Avenue.

The mixer is in the shape of a cube, about two and one-half feet square, and is constructed upon two wheels, with a tongue, and is drawn by two horses. It holds about a quarter of a yard of material.

The cement is dumped into the mixer, then two men shovel it full

of gravel. A small tank supplies the water, and when the machine is started begins to spray into the gravel. The mixer turns over and over as the machine is drawn along by the horses, and in traveling about one block the contents are mixed more thoroughly than can be done by hand, and with a great saving of time and labor.

The machine's portability is one of its strong points, and Mr. Cornwall says that upon street work and on ordinary jobs that it will do twice as much work as any other mixer. With it he is now mixing and putting in the foundation a sack of cement and seven sacks of gravel every five minutes.

If possible, I will get the description from *The Post* which is mentioned in this article.

JOSEPH KUZARA
118 Gem Street
Helena, Montana

incorrect use

Sir:

One of your recent issues contained a very helpful article on correcting surface defects in concrete. Although I'm not in the concrete business, I plan to save the article for the day when I get around to patching some of the imperfections in the cellar walls of my new house.

Professionally, however, I must take exception to what we feel is an incorrect word usage. Several times in this article there are references to "carborundum" stones. "Carborundum" is the registered trade mark of the Carborundum Company of Niagara Falls, N. Y., for their silicon carbide abrasive products. A more correct reference in this article would have been "silicon carbide stone" or "abrasive rubbing brick."

R. N. PERRY, JR.
Norton Company
Worcester, Mass.

TIPS FOR BETTER CONCRETING

Here are some useful hints for handling concrete that can make the difference between a poor job and a good one.

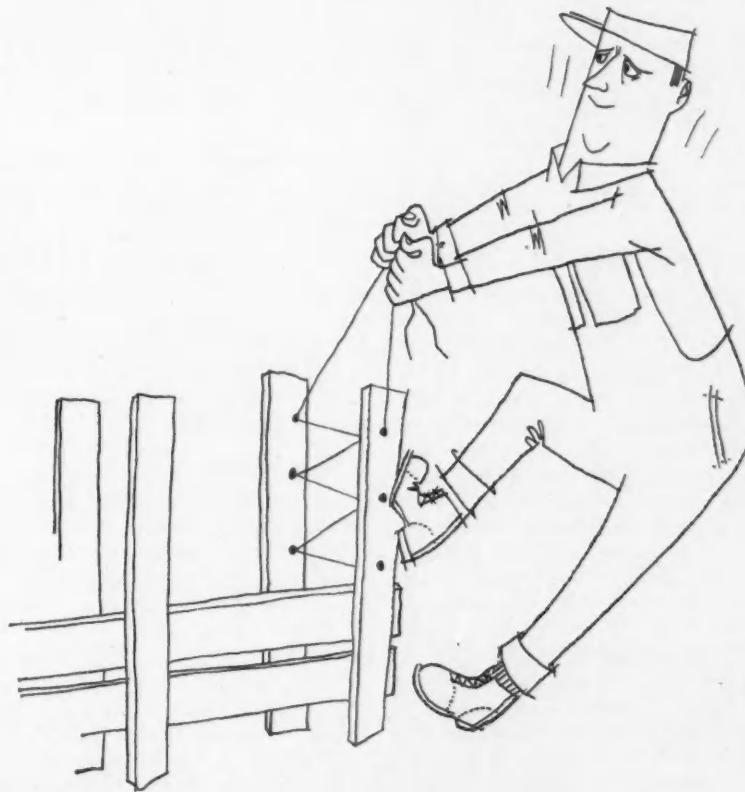
THE BEST MATERIALS in the world cannot, by themselves, guarantee a fine finished job. Any good concrete contractor knows it takes a lot more than top-quality aggregate and cement to produce a durable finish. Skill in handling ingredients is the necessary step that turns the trick. The hints and suggestions that follow may be an old story to some, a reminder to others. The important thing is that these procedures cost no more and virtually assure a top-notch job. Disregarding them can be extremely costly.

Don't add water

The concrete delivered to your job has been carefully proportioned and thoroughly mixed to produce the strength you ordered. Adding extra water is like diluting the oil in your car. The extra water reduces strength and durability, increases bleeding, shrinkage, and finishing time.

Check your form work

Always remember that freshly placed concrete puts tremendous pressure on forms. So check your forms before placing, especially the bracing. Use adequate studs and walers and good form ties and rods. Forms must be tight so that there will be absolutely



Forms must be braced for the weight of the pour.

FILE: Job Practices

no seepage. Loss of mortar causes honeycombing; loss of water causes sand-streaking.

Use a good oil or other coating on the inner surfaces of the forms to keep the concrete from sticking to exposed areas. Only be careful to oil lightly—too much oil can ruin the set of the concrete at the surface and produce a soft and dusty finish.



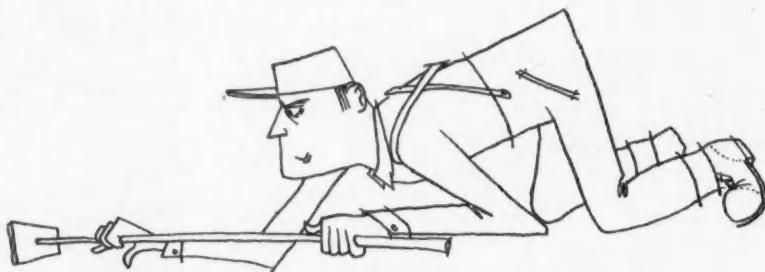
Nix on extra water in the mix.

Concrete to be placed, not poured

Don't expect good concrete to flow into place without some work. It should be placed very carefully by dropping vertically into forms. To do this, you may need a movable hopper or elephant trunk. If concrete is allowed to strike one side of the form and bounce off, it will separate and cause stone pockets and sand-streaking.

Where forms are deep, some bleeding or water gain must be expected. Unless corrected, however, this can result in a soft layer of concrete at the surface. To prevent this, ask for a drier load to finish off the job.

Place your concrete so that the forms are filled in shallow layers. Then spade carefully and vibrate properly as it rises in the form. It is good workmanship to detail one man to pay special attention to form faces, corners, and around reinforcement.



Place carefully—don't miss the corner pockets.

Don't overwork concrete

Your concrete is good concrete when it leaves the truck. Cement, sand, and aggregate are evenly mixed. The only purpose in working it further is to keep the heavier aggregates evenly distributed throughout the mix. Overworking—particularly a "soupy" mixture—causes separation. The larger aggregates and coarse sand settle at the bottom leaving the fine sand and water at the top of the form. This causes crazing, checking, and a poor looking job.

Vibrators are excellent tools for placing dry mixes. They prevent voids and rock pockets. However, handle vibrators carefully with wet mixes, or they bring too much cement, water, and fine sand to the surface of the concrete. When this happens, order drier mixes.

Drier mix on floors and pavements

Avoid wet mixes for floor or pavement work. A drier mix will give you a better job and enable you to float and trowel sooner. The sub-grade of a floor should be thoroughly sprinkled and dampened before placing concrete, particularly in warm weather. When placing concrete in sandy areas, you may have to cover the sub-grade with building paper.

Curing improves concrete

All concrete must be properly cured to obtain the desired strength and durability. Concrete correctly cured has less dusting, higher strength, less shrinkage, less cracking, and a better surfacing.

Always begin curing as soon as possible after the concrete hardens. You can keep the concrete from drying out too fast by sprinkling repeatedly with water, or sealing the surface with water-proof paper or a good membrane curing compound. Membrane curing compounds are a most practical method, for they can be brushed or

sprayed on the moist surface immediately after the final finishing operation, or when the forms are stripped.

Correct cylinder making

Correct cylinder handling is absolutely necessary to prevent false tests. Follow this procedure for accurate results: Use paraffin-coated paper or steel molds to make three cylinders for the 28-day test. Take your sample from at least three parts of the load. Remix sample before filling molds. Place molds on smooth level surface and fill in three equal layers. Rod each layer 25 times. When rodding the second and third layers, the rod should just break through into the concrete underneath. Overfill the third layer, rod, and strike off the excess smoothly. Cover the tops of the cylinders.

Don't move the cylinders until they are thoroughly set—usually after 24 hours. Protect them from temperatures below 60 degrees. Then send the cylinders to the laboratory as soon as possible for standard curing.

Cold weather suggestions

As the temperatures drop, so does the early strength of concrete. You can get high early strength mixes, or concrete containing calcium chloride for cold weather. But nothing takes the place of heat and protection. Don't let special mixes lull you into a false sense of security. There is actually no such thing as an "anti-freeze" for concrete.

Don't forget—it's always colder at night and it may be colder tomorrow. Be prepared to protect the concrete and provide heat if necessary. Have tarpaulins and salamanders ready at the job site. If possible, postpone placing the floors until the building is under a roof, the windows are in, and the heating plant in operation.

END



**"We stripped this form in 3 days...
with POZZOLITH concrete"**

*"This accelerated schedule saved us the cost
of additional forms on the new
Kansas City Air Terminal job"*

EDWARD D. KELLY, President
Interstate Construction Corp.,
Kansas City, Missouri



NEW TERMINAL FACILITIES at Municipal Airport, Kansas City, Missouri • Contractor: Interstate Construction Corp., Kansas City, Mo. • Architect-Engineers: Cooper-Robison-Carlson-O'Brien, Kansas City, Mo. • POZZOLITH Ready-Mixed Concrete; Concrete Materials, Inc., Kansas City, Kansas



ROLLING FORM for thin-shell roof is stripped on third day. High early strength of POZZOLITH concrete allows accelerated production schedule . . . cuts contractor costs significantly.

"Concrete strength of 3750 psi in 3 days—that's the kind of performance we got with POZZOLITH concrete on the new Kansas City Municipal Airport Terminal job. Stripping our big rolling form on the third day enabled us to place one 48-foot roof shell section each week."

"To reach the required design strength in minimum time, the job called for extremely low-slump concrete . . . yet it had to be workable enough to consolidate around reinforcing steel in these 3-inch thin-shell sections. With POZZOLITH we got excellent workability, high early strength, and a superior finish with no honeycombing or cracks."

"The Master Builders field man worked closely with the ready-mix concrete producer and concrete technician on-the-job to aid in maintaining batch-to-batch uniformity—so important in critical concreting of this type. POZZOLITH concrete and Master Builders field service gave us an important edge over time and costs on this job."

For lowest cost-in-place . . . superior quality concrete—there's no equal to today's POZZOLITH. Call in the local Master Builders man to demonstrate how POZZOLITH can help put you ahead on your very next job.

The Master Builders Company, Cleveland 3, Ohio • Division of American-Marietta Company
The Master Builders Company, Ltd., Toronto 9, Ontario • International Sales Department, New York 17, N.Y.
Branch Offices in all principal cities.

MASTER BUILDERS. POZZOLITH®

*POZZOLITH is a registered trademark of The Master Builders Co. for its concrete admixture to reduce water and control entrainment of air and rate of hardening.

Symons Forms Ganged for Anchor Walls



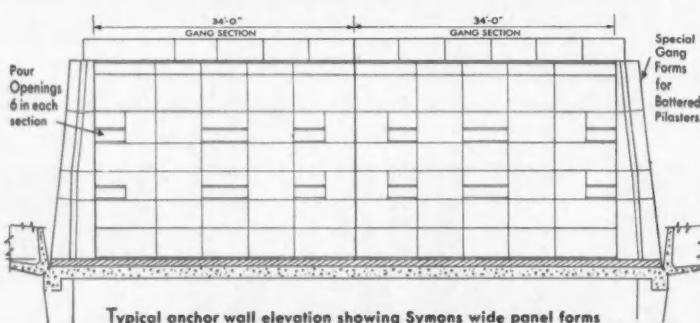
ASSEMBLY COST ONLY 5c A SQ. FT.

Modern forming methods answer the need of the jet age on the new TWA hangar at New York's International Airport. Symons 4 x 6 and 4 x 8 foot panels ganged in units 34 feet wide by 27½ feet were used for forming the 28 anchorage walls which straddle the full 80 foot roof width of the main building.

By using this method of forming, the contractor, Grove, Shepherd, Wilson & Kruge, Inc., poured the hangar in place at the cost of a precast structure. Panels were assembled on the ground at a cost of only 5¢ a square foot. It took about 15 minutes for a crane to tilt a gang form off the slab and inch it into place on the roof. 15,000 square feet of Symons wide panel forms were used in this gang forming operation. Symons wide panel forms have steel struts and 2 x 4 cross members to strengthen the panel and minimize deflection during pouring. Tie holes in the steel struts allow insertion and removal of special ties. Any strength tie may be used, including Williams removable end ties. Individual panels are built in 6' and 8' lengths and 30", 36" and 48" widths.

Project Manager, A. R. Maxwell, working closely with the local Symons forming engineer, devised this fast, efficient method of forming. This type service is available to all contractors, as well as the preparation from your plans, complete form layouts, bill of materials and recommendations for the best and least costly method of forming —there's no charge or obligation.

Symons Forms Shores and Column Clamps may be rented with purchase option—rentals to apply on purchase price. For more information on Symons products and service send for our FREE catalog.



Typical anchor wall elevation showing Symons wide panel forms ganged into units 34 feet wide by 27½ feet high. There are a total of 28 cable anchor walls on roof of the main building.

 **Symons**

SYMONS CLAMP & MFG. CO.

4271 Diversey Avenue Dept. K-9

Chicago 39, Illinois

Warehouses located in California, Kansas, Minnesota, Pennsylvania and Texas.
Sales offices and agents in principal cities.

You Can Cut Your Reading Time

Busy concrete men have more reading to do now than ever before, and less time for it. To help you keep up with the flood of printed information that crosses your desk, here are some timely suggestions on how you can increase both your reading speed and your comprehension.



MANY ENGINEERS, technicians and executives in the concrete industry are now using only about 20 percent of their reading capacities. The general reading rate of the average businessman is less than 250 words a minute. Slowness in reading speed can be attributed directly to reading word-by-word, at a rate not much faster than one can talk—and try talking faster than 250 words a minute! Trained readers can attain speeds of 1000 words per minute, and more.

The Reading Laboratory, Inc. has

trained hundreds of executives in 30 major corporations during the past eight years. The results of this training show in each case an impressive improvement in both reading speed and comprehension. At one company, the reading rate of technical material increased 105.7 percent with a commensurate gain in comprehension from 55 percent to 78 percent accuracy. In another company, the average group gains were 270 percent. The two dozen executives who took the course came from every major area of management.

do you read word by word?

The very slow reader whose comprehension and speed are both inadequate, has the following bad habits: (1) He makes too many pauses ("fixations") on a line of print, that is, he tries to read every word instead of reading a phrase at a time; (2) He wastes time going back to re-read words or whole sentences; (3) He has no regular reading rhythm but pauses

too long on one fixation and too briefly on another. The slower he reads, the less his mind is on the subject and the poorer is his concentration. Better reading means taking bigger visual "bites" of the printed page—training oneself to see and digest whole phrases or complete sentences rather than single words. The trained reader fixates briefly once on every phrase and absorbs it as a unit of thought. Furthermore, he focuses his eye directly over the line of print instead of looking directly at it since the white spaces between each word tend to break down a sentence into separate words.

The following sentence illustrates the eye movements of the skillful reader, with X standing for each fixation:

X X
The use of concrete as a building material
X X
can be easily promoted because of its strength,
X X
durability and dependability.

(continued on page 16)

SIMPLEX FORMS

Provide Jet-Like Speed on Large
AIR FORCE ACADEMY PROJECT

USED EXCLUSIVELY ON 1200-UNIT CAPEHART HOUSING JOB

When you've contracted to build 1200 units, speed, accuracy and economy are a must. That's why Del E. Webb Construction Co. and Rubenstein Construction Co. — a joint venture — selected 36 sets of Simplex Forms for this enormous Capehart project. Prior to getting underway, these contractors staged competitive tests, and only Simplex got the nod!

The project, which will house Air Force Academy personnel, is made up of single and multiple dwellings. Because heights varied from 3' 4" to 11', Simplex 4', 6', 8', and 10' panels were used. No walers were required! Projects such as this prove once again that Simplex has the edge in the forming field . . . to do a better job at greater profit!

YOU CAN MAKE MORE MONEY WITH SIMPLEX

Best for Large Projects or for Small, Single Jobs

Forms in 10', 8', 6', and 4' Sizes • A Complete Line of Accessories

- Long-lasting, 9-ply 1½" plastic impregnated plywood . . . outer plies won't peel.
- Heavy-duty steel backing bars run full width of panel to give added strength. Steel butts against steel as forms are locked together.
- Exclusive, patented locking levers. A tap secures or unlocks them . . . cam action pulls them together.
- Tie wires slip into position easily . . . break off cleanly.
- Lightweight panels! A 2' x 8' panel weighs less than 70 lbs. Easy to set, strip, or load.

WRITE TODAY FOR FULL DETAILS

SIMPLEX FORMS SYSTEM, INC.

5603 Industrial Ave.

Rockford, Illinois



The Reading Laboratory uses a device known as a flashmeter which helps the reader to increase the amount of material grasped at each pause of the eye. You can train yourself to phrase-read by encircling each of the meaningful phrases on a page and then going back and re-reading them as rapidly as possible. You will find after a few attempts at encircling phrases that a line of print begins to fall automatically into a series of meaningful word groups instead of separate, insignificant entities.

it is possible for anyone possessing normal vision to increase his visual span

Some people, with training, can recognize phrases of more than thirty letter spaces exposed on the flashmeter for only 1/100 of a second. However, no matter how efficient your vision becomes, no matter how many words you are able to see at a glance, you will still remain a word-by-word reader until you break what is called the "SEE-SAY-HEAR" habit of reading. When you were in the first grade, you probably learned to read words by seeing the letter, pronouncing the sounds and thus "hearing" words which you already knew from your spoken vocabulary. Until recent years, reading training stopped after the first six school years and students were left to continue reading in the same fashion in which they were first taught: See-Say-Hear. As long as you must say a word (either aloud or to yourself) before it can be comprehended, you can never take full advantage of your widened visual span.

You can easily determine whether you are dependent on hearing or saying words as you read them. Repeat aloud, until it becomes a kind of self-sustaining chant, some set of nonsense syllables—like "mumbo-jumbo, mumbo-jumbo." Then, still chanting, continue to read. If you depend on the hear-say method, the print will suddenly have become unintelligible. In order to rid yourself of this dependence and become a solely visual reader, continue to practice this chant aloud while reading. About ten minutes a day for a week or two will usually do the trick and you will soon find that your eye and mind alone are

(continued on page 18)



EXTERNAL ARCHES AND TILT-UP WALLS give simple dignity to Grace Lutheran Church, Denver, Colo. Baume & Polivnick, A.I.A., architect; Ketchum & Konkle, structural engineer; Marshall & Johnson, mechanical engineer. All are Denver firms. Contractor, Lippert Bros. Construction Co., Oklahoma City, Okla.

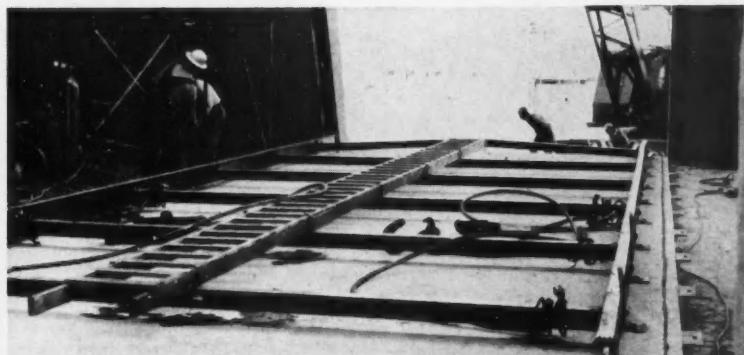
Inside-out construction pays tithe to new church

TO ACHIEVE the architect's dramatic design concept for this church, tilt-up wall panels were erected *inside* precast arches. This provided uninterrupted interior wall planes without distracting features, so that attention would be focused on the altar. It also reduced construction costs from 10% to 15%.

Wall panels were cast and cured on the floor slab (saving the cost of transporta-

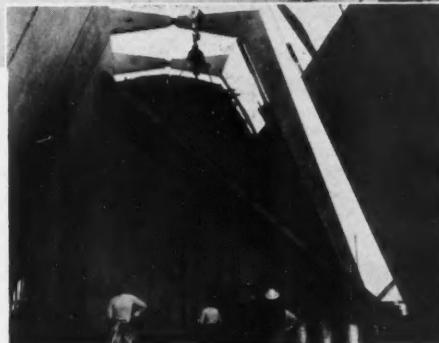
tion to a storage area) and then raised directly into position. Their lower edges fit between the floor slab and the bases of the arches, which are tied together laterally by steel tension rods under the floor. Angle clips, spaced on 2' centers along the sides, anchored the panels in the arches. This gave the smooth interior surface desired, and also eliminated several costly finishing steps.

Panels were 45' high, 18' wide, 6" thick. Each weighed about 27 tons. They were poured with a lightweight concrete designed for 2500 psi. Specification material, and deliveries timed to pouring requirements, were obtained by ready-mixed concrete, processed in truck mixers of certified design, capacity, mixing speed and water control accuracy.



STRUCTURAL STEEL STRONG-BACK is bolted to wall slab. Ladder gives access to anchor clips when fastening panel to arches.

ONLY INCHES TO SPARE as steel-reinforced wall panel is tilted up past overhanging opposite wall. End walls have been poured in place. Roof was poured later.



You have a right to insist on this Rating Plate. It certifies compliance with the high industry standards which are maintained for your protection by the

TRUCK MIXER MANUFACTURERS BUREAU

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Chain Belt Company
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Challenge Manufacturing Company
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Concrete Transport Mixer Company
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Construction Machinery Company
Waterloo, Iowa

The Jaeger Machine Company
Columbus, Ohio

The T. L. Smith Company
Milwaukee, Wis.

Westinghouse Transit Mixer Division
Indianapolis, Ind.

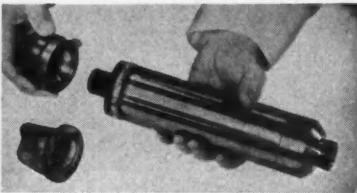
Whiteman Manufacturing Company
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Only Viber offers you Vibrator heads with *Interchangeable* rubber or steel tips!

Eliminate expensive grinding...insure a perfect finish on exposed concrete surfaces...make costly forms last longer...extend the life of vibrator housings!

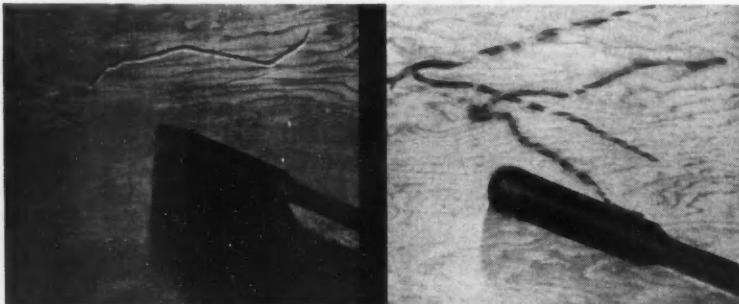


Tips screw on or off vibrator head easily, quickly...may be interchanged as required, replaced when worn.

YOU MAKE MORE PROFIT with Viber Vibrators! Viber replaceable rubber tips end damage to concrete forms and make forms last longer. By eliminating scarring of form faces, Viber rubber-tipped vibrators put an end to grinding and hand finishing of blemishes caused by gouged forms. Vibrator housings last longer because most wear occurs at the tip, which is replaceable.

TAKE YOUR CHOICE! Many contractors prefer steel-tipped vibrators for very harsh concrete with large aggregate, but the majority of Viber owners use rubber-tipped heads on all jobs. Whatever your preference, Viber (and ONLY Viber) gives you a choice of rubber OR steel—and lets you interchange them at will.

WHY NOT WRITE TODAY for the whole story!



Steel tipped vibrator heads often cause deep gouges and scars on form faces (left), producing blemishes on exposed concrete surfaces and requiring expensive grinding and hand finishing. Rubber-tipped heads don't damage form faces any more than a rubber eraser (right), extend form life, produce smooth finish concrete, eliminate hand finishing.

Viber Company, 726 South Flower Street
Burbank 22
California



Pioneers and leaders in the manufacture of vibrators.

doing the job of reading and comprehending.

another technique which will be very valuable for engineers to acquire is that of "pre-reading"

By pre-reading, the Reading Laboratory means a time-saving preliminary survey of any article, report, business letter or selection of practical prose. It is a particularly important first step in reading any complicated or difficult material. Not every piece of written material is of equal importance to any given reader. A pre-reading will tell him whether he will profit by a thorough reading of the item at hand or if the discussion is too elementary and simply repeats what he already knows. If the material is too advanced, he will know from his pre-reading that he must get a better background in the subject before tackling the selection. On another occasion, a pre-reading may indicate that the answers to certain of the reader's questions may be found in the article or that a few new and interesting points are raised in an



otherwise elementary discussion. In addition, pre-reading makes thorough reading more profitable, for the reader's advanced sampling of the author's style and thesis will enable him to get through the article all the more quickly and still derive a maximum of comprehension.

The basic rules for effective pre-reading will apply to most material which engineers and others in the construction field must cover—and they are well worth learning:

1. Look first at title, author and date. This can tell you a lot. In examining a book, the table of contents, preface and index will usually give

(continued on page 20)

3 points to watch for better winter concreting

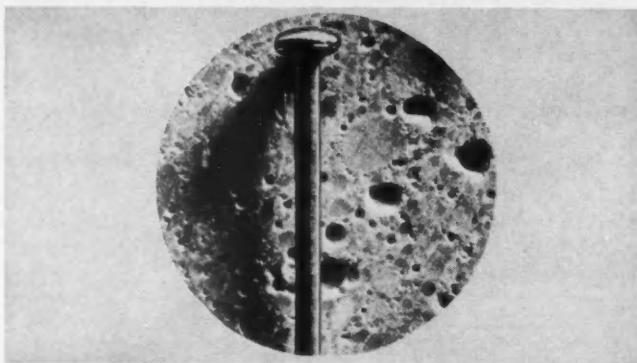
1.

1. Plan ahead. Concrete will be delivered at a temperature between 50° and 70°F. Be ready to place at once. Have forms and reinforcing steel free from ice and frost—live steam works best. And, of course, never place concrete on frozen ground. It will settle when it thaws.



2.

2. Specify air-entrained concrete for all jobs—structures and pavements. Resistance to freezing and thawing is greatly increased—freezing water in the concrete has room to expand harmlessly into the air cells. Magnified photo shows size of air cells compared with ordinary straight pin.



3.

3. Provide suitable curing temperatures. Use protective coverings as needed, either with or without moist heat, to keep concrete at 70° or above for 3 days, or 50° or above for 5 days. Protect from freezing for at least 4 days. Rate of cooling concrete shouldn't exceed 1 or 2 degrees per hour.



**quality
concrete**

*Write for free literature on winter concreting.
Distributed only in U.S. and Canada.*

PORLAND CEMENT ASSOCIATION

Dept. A 10-98, 33 West Grand Avenue, Chicago 10, Illinois

A national organization to improve and extend the uses of concrete

THE '59 LINE OF



CONTRACTORS' EQUIPMENT



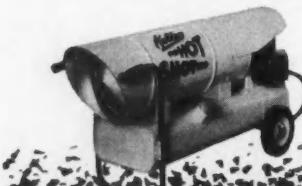
POWER TAMPERS

Self-propelled . . . delivering 2400 impacts a minute. Two models: 18" wide shoe, and 36" wide shoe. For packing down earth backfill to maximum density next to foundations, on road-widening jobs, etc. Also for finishing blacktop . . . with heater shoe attachment available.



POWER BUGGIES

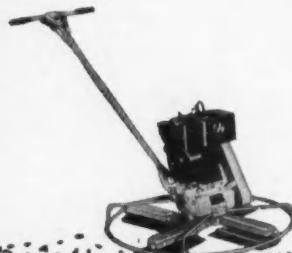
Positively tops for fast and dependable handling of concrete and other materials. Hydraulic mechanism dumps or spreads loads up to 10 cu. ft. and there's full power in both front wheels for extra traction. Safety step and guards protect operator.



SPACE HEATERS

What a blast! From the Kelley Hot Shot Space Heaters, one delivering 120,000 Btu/Hr and the other delivering 320,000 Btu/Hr. Let 'er blow outside . . . work goes on inside with Kelley Hot Shots! For work around walls, floors, scaffolds and hundreds of other construction jobs.

- UP-TO-DATE DESIGNS
- CAREFULLY ENGINEERED AND FULLY TESTED
- BUILT FOR ROUGH USE
- SPEEDS UP WORK... SAVES MONEY



POWER TROWELS

Six models to choose from . . . 2 de-luxe Hydra-Trowels, 34" and 44" sizes, with fingertip blade control . . . and 4 super models with manually-adjusted blade pitch: 24" Kelley Bantam, 29" Kelley Boy, the popular 34" Kelley Chief and the big 44" Kelley Commander . . . a size for every job.



COMPACTORS

The new Kelley Compactor, with "Compaction Control" . . . easier operating, faster, more powerful. For compaction-floating all types of concrete floors, for keying in surface hardeners, and for bonding dry-tamp floor topping to a concrete slab. Grinding attachments available.



MACHINE DIVISION

The Wiesner-Ropp Co., Inc.

Please send us information on Kelley products.

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Buffalo 23, N.Y.

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you a valuable over-view of the material.

2. Read thoroughly the first two or three paragraphs of an article. These almost always introduce the subject in a general way. In the case of a report or book of a technical nature, read the introductory and concluding or summarizing chapters.

3. In the body of the discussion, start reading only the first sentence of each paragraph. Note all sub-heads and bold-faced or italicized type. Pause to look at any pictures, tables, graphs and charts. They are usually a genuine aid to fuller understanding and mastery of the written material.

4. As you reach the end of the article, the first sentences of the paragraphs will tell when the author is beginning to draw his final conclusions or sum up his discussion. Read these summarizing paragraphs thoroughly.

5. To pre-read a business letter, note the letterhead, the signature and read the first line to determine whether the writer is getting right down to business. If he isn't, drop almost two-thirds of the way through the letter for the central point.

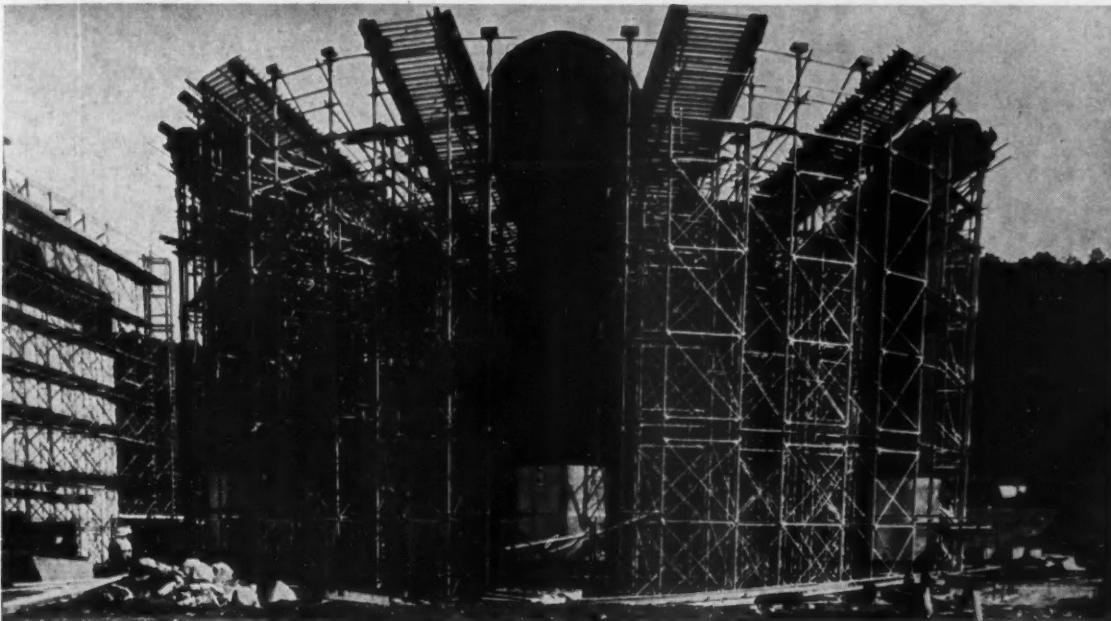
See if you can effectively apply the techniques of pre-reading discussed above by turning to one of the articles in this issue which you have not yet read. Give yourself about three minutes to see if you can get a general framework of the selection into which you can subsequently fit the details you will gather during thorough reading. Remember that when details are seen to contribute to an important generalization, they acquire new value and significance. Give pre-reading a chance to become as automatic as lighting a cigarette. You'll never miss the effort, but your gains in reading efficiency will be rewarding.

both skipping and skimming are additional reading skills which can save you time on a large scale

To skip of course means to leave unread. You skip when pre-reading indicates that the material is irrelevant to your purposes and that the material either tells you nothing you don't already know or that it is so highly specialized you need additional background before tackling it. Skimming is employed to find a particular piece of information in a selection or to grasp quickly the main ideas and

(continued on page 22)

Shoring Methods . . . by Patent Scaffolding Co.



Extreme Load Bearing Problem Solved With PS Co. Shoring

at Yankee Atomic Electric

JOB LOCATION—New 134,000 kilowatt atomic energy producing electric power plant for Yankee Atomic Electric Company, Rowe, Mass. Cost estimated at \$50,000,000. Scheduled for completion in late 1960. Now in construction. See artist's sketch of finished plant.

ENGINEERS AND DESIGNERS—Stone & Webster Engineering Corporation and Westinghouse Electric Corporation.

CONSTRUCTORS—Stone & Webster Engineering Corporation.

PROBLEM—What type of shoring to use to support at considerable height above grade a superstructure forming the base and shield around atomic reactor section of the plant—see elevation view diagram.

Factors to be considered were these: 1—The outer concrete shield for the reactor section, measuring 82' 6" in diameter, consists of a conical shaped bottom slab averaging 5' thick; 2—This slab is in turn supported by the circular inner and outer walls above the slab. These walls are 5' wide by an average height of 16' above the slab; 3—The massive circular walls are to be poured monolithically with the slab, since they act as beams which, after developing sufficient strength, support the conical slab between the columns.

SOLUTION—PS Co., working closely with Stone and Webster, devised the load bearing engineering factors to be met by the shoring equipment. These included—shoring must be erected to 30'-high at the low point and 50'-high at the high point. Shoring must be spaced to carry a maximum load of 21-tons on each leg under the ring walls, 15-tons on each leg under the conical base.

From the many types of PS Co. equipment available, "Extra Heavy Duty Shoring" components are specified by both companies' engineers as the correct supporting medium for the job. The load bearing capacity of this equipment meets the requirements. An engineering layout, supplied by PS Co., provides exact detailed plans for correct placement of shoring legs and erection of the equipment. The photo shows how the Shoring is erected, ready for the forming lumber. Exact height adjustment is achieved by the use of 25-ton capacity screw jacks. As proved on this unusually heavy supporting problem—there is a type of PS Co. Shoring equipment available to do practically any kind of shoring, regardless of the size or weight of the job.

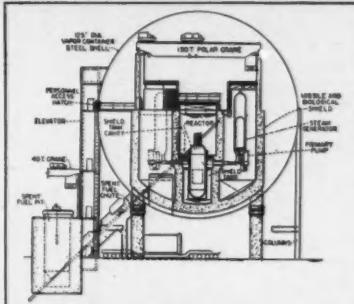
NOTE—Additional PS Co. equipment to be used 2,000 frames of "Trouble Saver" 5'-wide Sectional Steel Scaffolding to provide platforms for exterior work around the periphery of the vapor shield and "Trouble Saver" 2'-wide Ladder Scaffolds to support heavy concrete beams of other structures.

FOR GREATER SAFETY...EFFICIENCY...ECONOMY

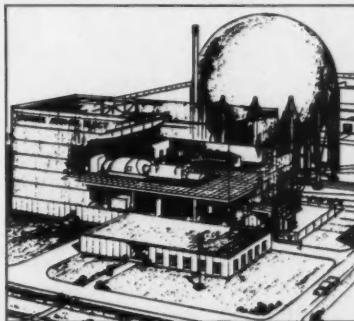


THE PATENT SCAFFOLDING CO., Inc.

38-21 12th Street, Dept. CCM, Long Island City 1, N.Y.
1550 Dayton Street, Chicago 22, Illinois • West Coast: 6931 Stanford Ave., Los Angeles 1, Calif.
In Canada: 355 Dufferin St., Toronto • Branches in all Principal Cities



ELEVATION VIEW showing the concrete area which is being supported by the "Trouble Saver"® Shoring.



SKETCH of the 134,000 kilowatt plant, which will cost about \$50,000,000, scheduled for late 1960 operation.



(continued from page 20)



significant details of a selection.

To skim narrow columns (newspapers, most magazines) move your eye in a zigzag fashion down the page: near the left-hand end of the first line, the right-hand end of the second, etc. To skim wider columns (most books) hit each line twice: once near the left, once near the right side. This method is particularly successful in skimming for specific information. In skimming for main ideas, be sure to read the first sentence of each paragraph and then let your eyes swing

down the rest of the paragraph in the manner described above. In practical prose the first sentence of most paragraphs usually carries the principal statement. As you become practiced in the technique of skimming, you will notice that the number, name or phrase you are looking for seems to stand out on the page or that in a very brief time you have digested the main ideas in an otherwise weighty mass of material. IN ALL CASES OF SKIMMING, KNOW SPECIFICALLY WHAT YOU ARE LOOKING FOR.

We have said that reading by meaningful phrases will increase comprehension and concentration because your eyes can then keep up with your mind and your reading process becomes more like your thinking process. However, concentration is also affected by external conditions (environment, etc.) and internal conditions (your interests and emotional problems). And, of course, if the material doesn't vitally interest you, you will probably find that your mind often tends to wander. When the interest is at high pitch, there should be no concentration problem. Intense, sustained concentration and comprehension will proceed rapidly. The following suggestions may help you to solve your concentration disabilities.

1. *Take care of your eyes.* The condition of your eyes should be checked by a competent optician about once every two years, and at once if you notice eyestrain more than occasionally.

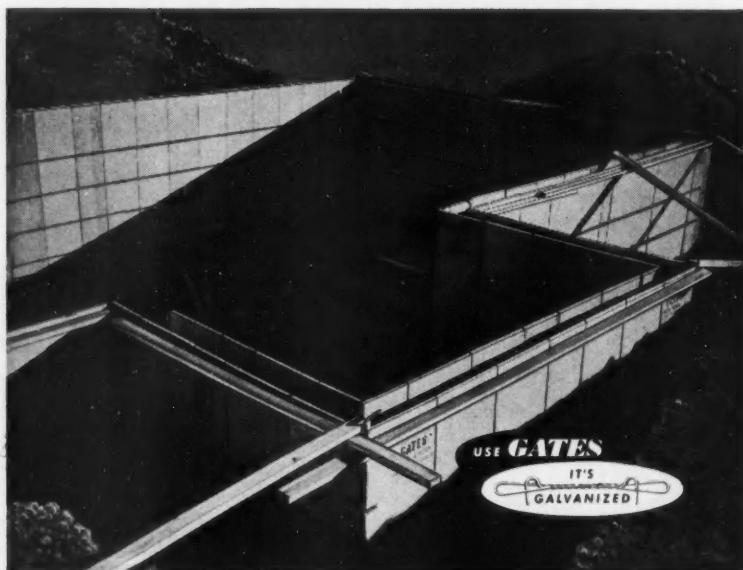
2. *Create a good reading environment.* Be sure to choose a place where your reading material is illuminated by a 100-watt bulb. Avoid glare by having at least one other light of equal intensity in the room.

3. *Do most of your concentrated reading in a particular spot.* You will soon begin to associate these surroundings with concentrated reading efforts.

4. *Try to create a "balance of interests."* If you are bothered about a situation, force yourself to come to some decision and take immediate action *before* you attempt to read. Reduce the amount of attention directed elsewhere and turn it back to your reading.

5. *Read with a purpose.* Formulate questions as part of your pre-reading; anticipate what points the author is going to make; weigh his

(continued on page 24)



Gates System speeds pier-type residential forming

Abnormal soil conditions dictated that "caissons" or piers be used in place of ordinary footings on this Westminster, Colorado, residence. Square piers were first located as specified, then Gates Horizontal Rod Forming System was erected over soffiting placed between the piers. Because of Gates on-the-job versatility, the forms went up as easily as with footings and the small amount of bracing and walering shown was all that was necessary. No panel bracing or stiffeners are ever required with Gates thin-panel forming. The contractor reported results excellent...And, as with forming using conventional footings, total costs were kept low.

Information designed to help you form better at lower cost is available now. See the "yellow pages" for your local dealer, or write direct. No obligation, of course.



Gates & Sons, Inc.

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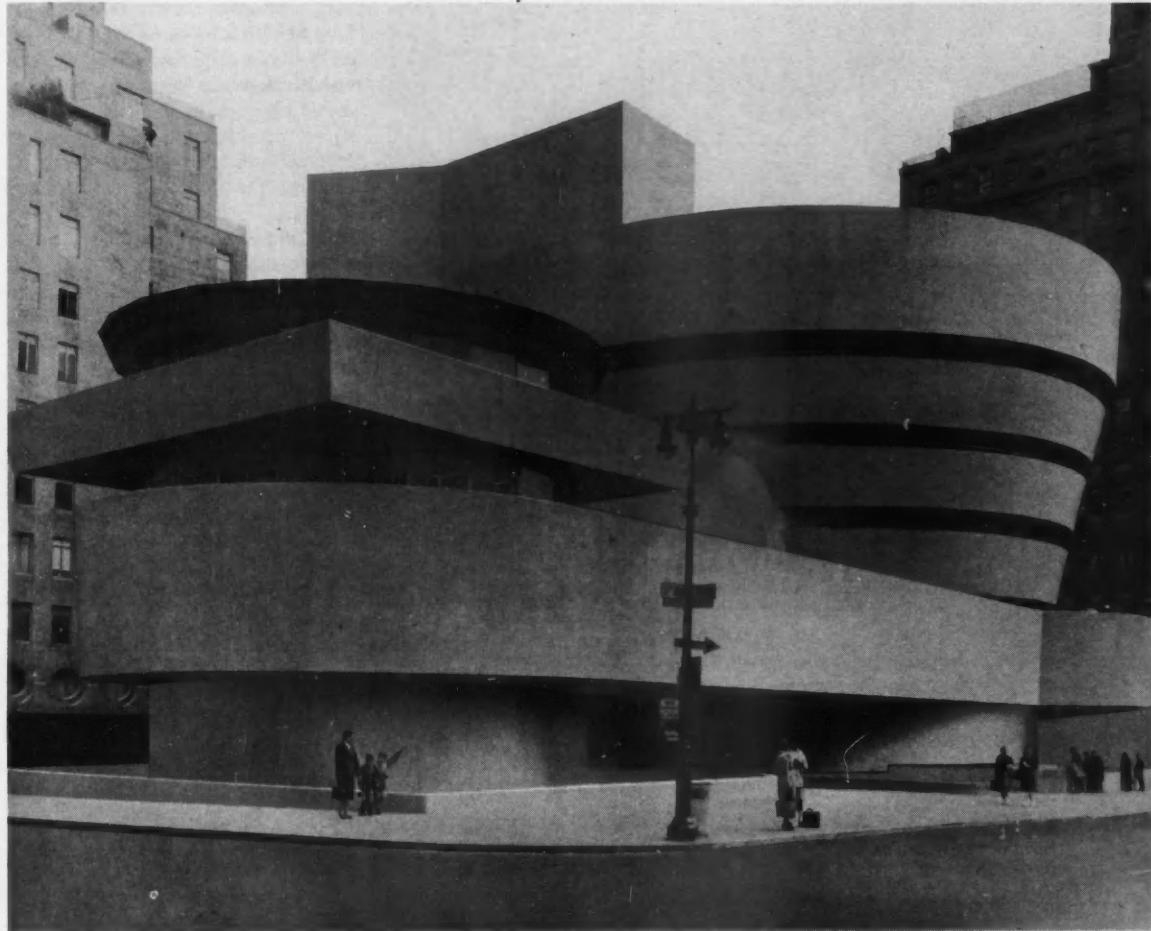
**Improved
consolidation
with
PLASTIMENT**

The new Guggenheim Museum . . . Frank Lloyd Wright's daring architectural achievement on New York's Fifth Avenue . . . testifies to the ability of Plastiment to provide sound, well-consolidated concrete under conditions of involved forming and complex reinforcing . . . Selected by the contractor, Plastiment Retarding Densifier was used to minimize cracking, to assure more uniform quality, and to provide architecturally pleasing exposed concrete over large areas . . . Plastiment gave the desired workability at 3 to 4 inch slumps, resulting in a minimum of surface defects when forms were stripped.

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Architect-Engineer: FRANK LLOYD WRIGHT / General Contractor: EUCLID CONTRACTING CORPORATION



The unique structure features a helical ramp making 6 turns at grades of 3% and stiffened by exterior webs at 30° intervals.



SIKA CHEMICAL CORPORATION

Passaic, N. J.

effectiveness in leading up to them; try to stay one step ahead of the writer. You will find that this keeps you busy, with little mental room for distraction.

6. Mentally summarize as you read along and after you have completed a selection. You will gain a more thorough sense of the organization or skeleton of the article and be better able to distinguish between main and minor points.

All of these techniques are part of the concentration picture. Remember, the marks on the printed page are merely symbols for the author's thought. Get the meaning behind the words; be an active reader; read with a purpose, form questions and anticipate the author's line of reasoning. With constant practice, you will soon lick the concentration problem and sprint along the printed line with maximum comprehension and retention.

some additional hints

The techniques of phrase-reading, pre-reading, skipping and skimming, questioning, anticipating and summarizing are all major time-saving devices. Once these methods have been devel-

oped, mastered and applied to all of your reading, you will find that you have probably cut your reading time in half. Now here are some additional suggestions to augment your more efficient reading habits.

Vocabulary extension is of course a pre-requisite to developing your reading ability. You have many opportunities to enrich your vocabulary every day—both in your technical work (reports, trade journals, etc.) and in your general reading (newspapers, magazines, novels, general non-fiction, etc.). The best and most consistent method of acquiring new words is learning them in context. When you encounter a new word in your reading, before rushing to the dictionary try to deduce its meaning from the way it is used. Put a check in the margin next to the new word and continue to read. When you have completed the article or chapter, THEN look up all the new words, noting the particular meaning which seems to fit the word in your context. Constant reference to outside sources DURING the course of your reading will of course slow you down considerably. The dictionary should, there-

fore, be used only when the word is of such a nature that your comprehension of the remainder of the selection will depend on your knowledge of the particular word.

Critical reading and evaluation. The critical reader is not satisfied with merely comprehending what is said. He draws on his own background and experience to test what he reads. For example, if you read an article in which the author raises objections to the use of truck mixers for making pavement-type concrete, you may recall other articles on the subject which stress the advantages of this kind of concrete or you may know from your own experience of its suitability for modern highway and street paving. Conversely, you may agree with the article at hand because your experience with truck mixers has been that it is difficult to control the consistency of the concrete. In any event, you will weigh the author's thesis and supporting data in light of your own prior knowledge. If you come across ideas and materials totally new to your experience and background, you will still make a running analysis as you read, distinguishing always between

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the author's report (the factual account of an event or situation) and his evaluations (judgments based on the report). Determine whether his argument is complete and consistent with his supporting data. REMEMBER, THE CONCLUSION IS VALID ONLY IF THE ASSUMPTIONS ARE.

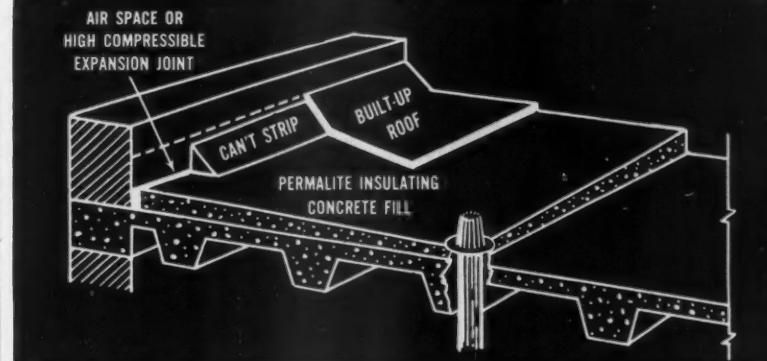
Self-pacing. The efficient reading of any piece of practical prose involves the highest speed that will yield the required degree of comprehension. To do this you must know your own capabilities, be aware of your purpose in reading a selection and from pre-reading be able to judge its difficulty. Thus you can regulate your speed accordingly and read at your maximum efficiency. Naturally your reading of cost comparisons or material relating to highway specifications will proceed at a slower rate than your reading of a biographical sketch of a prominent consulting engineer. The well-adjusted reader is comparable to the skilled driver: just as the latter does not attempt to roar down a turnpike in low gear so the skillful, trained reader adjusts his pace to the level of difficulty of any given material.

These then are some of the major techniques which are now being used by engineers, scientists, top-level executives and businessmen in all fields to reduce the time they have to devote to their "must" reading, to enable them to comprehend ideas in print more quickly and more accurately, and to make reading more of a pleasure. Developing advanced reading skills into efficient reading habits pays off so significantly in dollars and cents that many major companies, as we noted in the introduction to this article, have spent thousands of dollars to enable their employees to develop and master these skills. With practice and diligent application of these techniques you will soon see for yourself the far-reaching advantages of developmental reading training.

END

A more complete discussion of all aspects of reading improvement, plus practice exercises, is available in the book *CUT YOUR READING TIME IN HALF*, written by The Reading Laboratory and available for \$1.25 from its publisher, Developmental Research Institute, Inc., Dept. "A", 500 Fifth Avenue, New York 36, New York.

Slope to Drain and Insulate the Roof - both in one operation with **Permalite[®]** **INSULATING CONCRETE**



CUT COSTS, TOO . . . no need to steel-trowel the structural concrete deck; just rough-screed it to proper thickness. Permalite Insulating Concrete makes perfect bond.

HIGH INSULATING VALUE. A 2" thickness of Permalite Insulating Concrete gives insulation equal to 1" of rigid insulation board.

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EXCELLENT STRENGTH Permalite Insulating Concrete is far stronger than other conventional insulating materials.

FIRE-SAFE—can't burn . . . gives greater fire resistance than any other type of insulation.

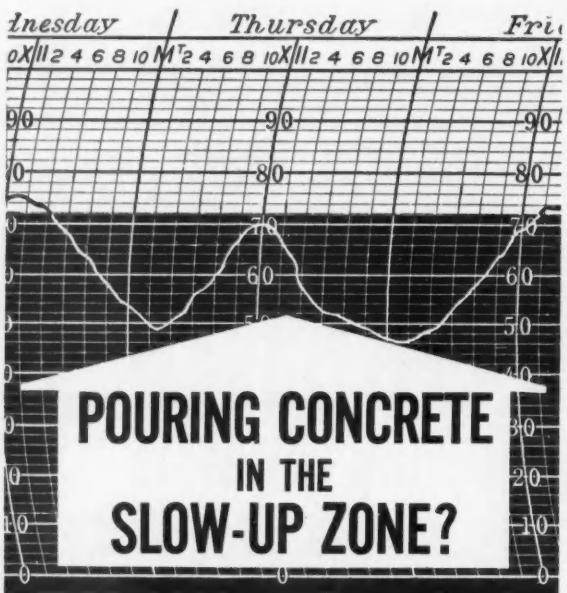
PERMANENT—can't rot or decay; termite- and vermin-proof.

ROOFING APPROVAL—All major roofing manufacturers approve properly installed Permalite Insulating Concrete as a base for 20-year bonded roofs.

See your Sweets File, or write for complete information.

PERLITE DEPARTMENT, GREAT LAKES CARBON CORPORATION

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Have your ready-mix supplier add SOLVAY CALCIUM CHLORIDE to avoid costly delays!

When temperatures vary from 70° down to 50°—it spells "SLOW-UP" which means costly delays in your concreting operations. This drop below 70° sharply decreases strength development and lengthens the waiting period before finishing.

A drop from 70° to 50°, for example, cuts 3-day strength up to 40%. To prevent this, add a low-cost 2% of SOLVAY Calcium Chloride to your concrete.

With this acceleration, concrete poured at 50° has a 3-day strength up to 40% greater than ordinary concrete cured at the ideal temperature of 70°!

When you use SOLVAY Calcium Chloride, you do away with overtime finishing, delays in form removal, delays between operations. You save up to 50% on protection time. And you get better concrete—increased in both early and ultimate strength—with lower water-cement ratio for more moisture-and-wear-resistant concrete.

SOLVAY® CALCIUM CHLORIDE speeds, but does not change, the basic action of portland cement. This use of calcium chloride is accepted by Portland Cement Association, Calcium Chloride Institute, leading highway departments.

Write now for full data!



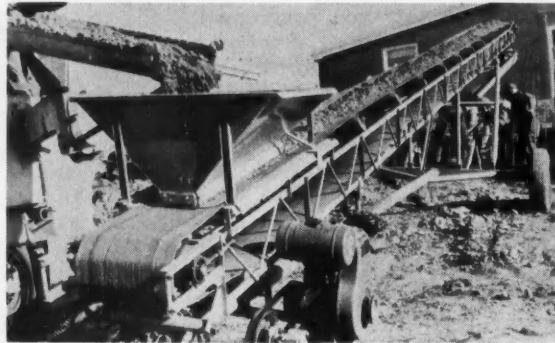
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products

For further information use check list on page 31.



belt conveyor

Primary application of idler roller belt conveyor is bridging over excavations and obstructions to place concrete into forms and elevating concrete into forms or hoppers. Machine can elevate 40 cubic yards of concrete an hour to heights of 22 feet and is virtually maintenance-free. Morgen Mfg. Co.

PROTECT EXTERIOR MASONRY WALLS

CONTROL WATER PENETRATION WITH THIS SILICONE WATER REPELLENT

Dehydratine No. 22 provides an easy, low-cost way to keep water out of porous but sound masonry walls. This colorless, silicone water repellent protects against water damage inside and out, without changing the appearance of your structure. Dehydratine No. 22 minimizes efflorescence and prevents discoloration. You simply spray or brush it on. Write for complete information. Address Dept. CC-124



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products

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concrete inserts

Superior threaded inserts offer flared heavy wire loop design for maximum strength in concrete. Completely enclosed threaded area eliminates possibility of concrete leakage or clogged threads. Threaded insert holding pointed setting plug can be quickly hammered into exact position on deck. No nails required, as embedded plug provides support for insert. Bulletin TI-1. Superior Concrete Accessories.

repair material

Introduced through an Epcast 541 seal and valving, Epcast 530, repair material for cracks in concrete, flows into cracks under small hydraulic pressure filling voids and internal openings. Good bonds are established upon curing at room temperature. Even small cracks are reached because of capillary action and good penetrability. Furane Plastics.

4 WAYS TO CUT STAKING COSTS

SIDEWALKS • DRIVEWAYS • CURBS
FOOTINGS • SLABS WITH BEAMS

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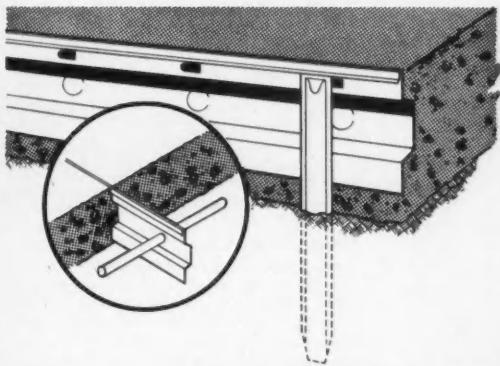
solid steel construction stake

ALWAYS A POSITIVE NAILING POSITION ... REGARDLESS OF AXIAL ROTATION

all purpose form brace

A Complete Concrete Form Staking Package

dee CONCRETE ACCESSORIES CO.
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Keyed Kold Joint Forms

A new concrete construction product that serves as form, screed, and true cold joint, left permanently in the concrete floor slab. The use of Keyed Kold Joint eliminates spalled joints... produces a cold joint structurally sound and architecturally beautiful. Keyed Kold Joint also eliminates costly make-up and stripping of split forms for checkerboarding. Saves up to 35% in cold joint form costs... results in neater, uniform joints.



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Dodson's Digest



Good Fortune

When Fred Nichols told me the other day that he'd lost a lot of time this past summer because his concrete was taking too long to set, I saw red!

Fred's been in the road construction business for years, but I just couldn't get him to use Calcium Chloride in his concrete mix.

We went to lunch at his favorite Chinese place a few days ago, and he started telling me all his troubles!

Well, before he could really get warmed up, I excused myself and talked to the chef for a minute without Fred seeing me. When I got back to our table, I started right in on him.

"Fred, Calcium Chloride in your mix can help solve most of your problems. It'll reduce your initial and final set times by almost *two-thirds*."

Fred's mouth was too full of almond duck to reply, so I kept right on talking.

"And that means a lot with the weather turning colder now. You can extend your season at both ends. You use Calcium Chloride, Fred, and I'll bet you a barrel of turtle soup you'll see more black ink on your books in 1960!"

"Dad," Fred smiled at my enthusiasm, "maybe I'll just try some of that Calcium Chloride."

Just then our waiter brought our coffee—each cup accompanied by one of those Chinese fortune cookies.

Fred grinned when he read his "fortune": "He who uses Calcium Chloride gets good concrete!" That fortune cookie cost me five bucks, but it was worth it. Then I read mine: "He who pays five dollars for fortune cookie should have head examined!"

—L. D. DODSON

P.S.—Find out how Wyandotte Calcium Chloride can help you lay better concrete in less time. Send for our folder, "How To Make Better Concrete Products and Ready-Mix." Just drop me a post card for your free copy. *Wyandotte Chemicals Corporation, Wyandotte, Mich. Offices in principal cities.*

Wyandotte
CHEMICALS

MICHIGAN ALKALI DIVISION
HEADQUARTERS FOR CALCIUM CHLORIDE



products

For further information use check list on page 31.



rubber pail

Twelve-quart contractors' pail is claimed to withstand severe punishment without losing shape. It will not leak, crack or bulge when holding mortar, concrete or plaster and is resistant to lime acids, salt water, chemicals, compounds, and extremes of heat or cold. No cleaning is necessary since hardened concrete falls out when pail is tapped. Cauchotex Industries.



power buggy

Improved controls and a drive engineered specifically for construction use are featured on Model 15-B power buggy, $\frac{3}{4}$ -ton capacity. Ten cubic foot dump bucket latches on chassis and is quickly interchangeable with a flatbed platform, making it adaptable for hauling concrete and other construction materials. Prime-Mover Co.

Easy, Proven Way to Permanently Bond New to Old Concrete —for less than 4¢ per square foot!

WELD-CRETE

Weld-Crete is the patented, job-proved liquid bonding agent which enables you to *permanently bond new concrete, or cement plaster, directly to any other structurally sound surface no matter how smooth!* No costly, time-consuming surface preparation. Just apply, let dry, and pour or trowel new concrete. Ideal for new construction, remodeling, repairs . . . ramps, floors, pre-cast shapes, driveways, highways, walls, machine mounts and pads. Weld-Crete has equal bonding permanence all climates, all surfaces, all sorts of conditions. When used with quick setting cement topping you can lay new floors, ramps, driveways one day and run heavy truck traffic over them the next. Get fact-packed literature from your Building Materials Dealer, see Sweet's File, or write us direct. Address Larsen Products Corporation, Box 5756S, Bethesda Maryland.

Typical WELD-CRETE Applications



GRANVILLE ST. BRIDGE, VANCOUVER, BRITISH COLUMBIA—One of the largest 8 lane bridges in North America. Here Weld-Crete was applied to bridge surface to bond cement dividing strips. Now, over 4 years later, bonds are as good as new. General Contractor: Dominion Bridge Company.



SEVEN CORNERS SHOPPING CENTER, FALLS CHURCH, VIRGINIA—During construction of this 600,000 sq. ft. structure, initially only part of floor was poured and floated to a smooth finish. Areas in which show windows would be added were poured as base slab only. Slab was coated with Weld-Crete. After store fronts were custom-built, delayed toppings of 1" to $1\frac{1}{2}$ " thick were poured with assurance of permanent bond to base slab. These toppings were then finished with asphalt tile, wood, or finish flooring of lessee's choice. Designed and constructed by The Kass Realty Co. of the Kass-Berger Organization under direction of J. Franklin Graff. Concrete Contractor: Moses-Ecko.

products

For further information
use check list on page 31.

form coating

Nox-Crete form coating is said to react chemically with concrete to prevent bonding between the poured concrete and inner surfaces of forms and molds. Cleaning forms is eliminated. Its action is claimed to be superior to that of paraffin oil, silicone or plastic compounds ordinarily used as releasing agents. Universal Builders Supply Co.

manual on joints

"The Design and Use of Joints In Concrete Structures" provides the contractor, engineer, architect, and others with authoritative, up-to-date information concerning the design, construction, and maintenance of expansion, contraction, and construction joints in concrete structures. Servicised Products Corp.

tubular scaffold

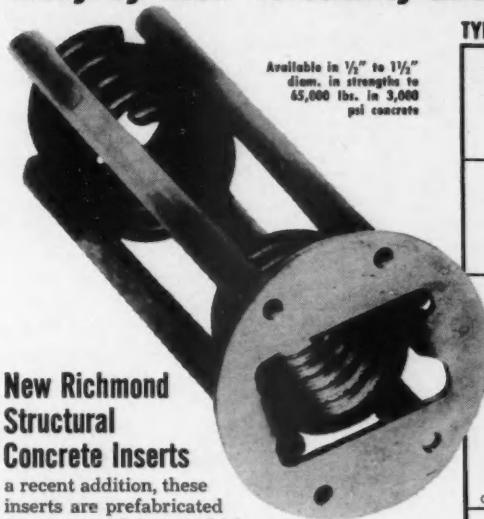
Tubular steel scaffold, materials hoisting towers, structural concrete shoring and other construction and maintenance equipment are described in bulletin 62. Illustrations and specifications are included. Bulletin 69 shows completed construction projects where this equipment was used in one or more applications. Beaver-Advance Corp.

flooring products

Text and illustrations in bulletin 659 describe paving, patching and grouting materials and brick, all emery-based, and bonding and curing agents as well as a special formulation with emery aggregate designed for heat resistance. This special aggregate, Cortland emery, is a form of corundum which is second only to diamonds on Mohs' Scale of Hardness. Walter Maguire Co.

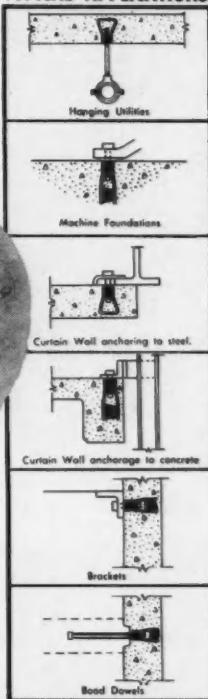
Richmond Concrete Inserts **SPEED THE JOB...** Safely and Economically

Fastening to concrete made safe and easy by their versatility and strength



Available in $\frac{1}{2}$ " to $1\frac{1}{2}$ " diam. in strengths to 65,000 lbs. in 3,000 psi concrete

TYPICAL APPLICATIONS



New Richmond Structural Concrete Inserts

a recent addition, these inserts are prefabricated from a special design which distributes the bolt stresses into the concrete for greater strength than any previously known device. Laboratory tests show these inserts to have ultimate strengths far in excess to their actual, recommended working loads. This strength performance permits designers to develop the full working strength of bolted connections with more than adequate safety factors. The Richmond Bulletin on Structural Concrete Inserts contains certified test data for these inserts.



Richmond Maileable
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Peerless Wedge
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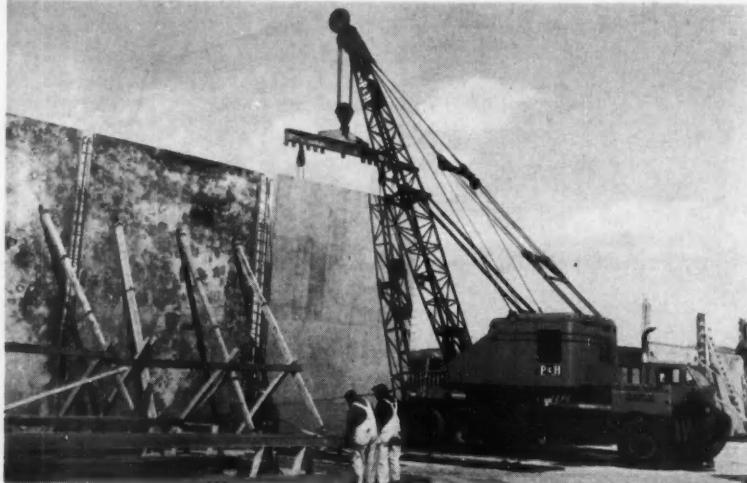
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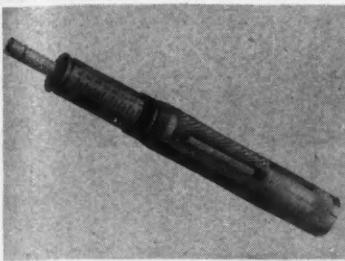


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pocket penetrometer

Simple, fast and accurate evaluations of the bearing capacity of soil on construction sites as well as in preliminary laboratory studies can be made with the pocket penetrometer. Guesswork in soil classification is eliminated. Soiltest, Inc.

dams

Reports on 25 major dams built in the United States, Japan, Canada, Alaska and South America are included in a 48-page publication. How Pozzolith was used to maintain low water content concrete specified for this type of construction is explained. Bulletin MBR-P3. The Master Builders Co.

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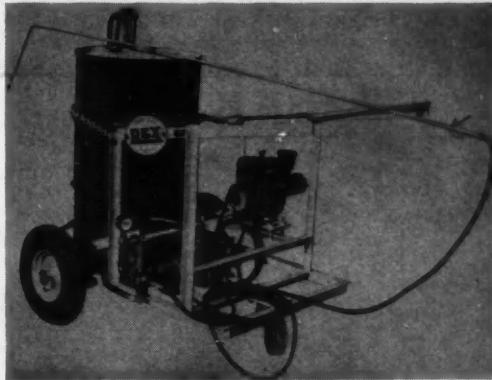
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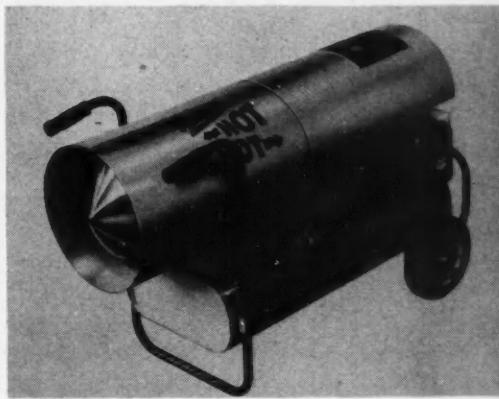
spray curing machine

A portable spray curing machine for use in limited or off-slab areas has rubber tires and mounting platform for a 55-gallon drum. A second model is hand-carried, has steel base plate and lifting handles. Chain Belt Co.



space heater

This small 75,000 Btu/Hr. space heater can be used to heat buildings during construction, and to warm workmen and work areas indoors or outdoors. It dries, warms, and thaws building materials, pumps and piping, and preheats construction machinery and equipment. One of a line of heaters of various sizes, all said to be clean, safe, smokeless and odorless. Kelley Machine Div.



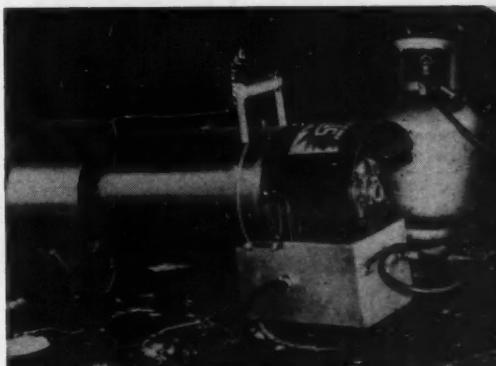
sidewalk canopy

Canopy frames provide a quick, easy method of making sidewalk canopies for pedestrian protection around construction sites. Frames are 7 feet 6 inches high by 6 feet wide and are composed of tubular steel members designed with reinforcing sections. Additional sectional scaffolding may be erected on planking laid across tops of frames. Patent Scaffolding Co.



space heater

Portable, 45-pound space heater which burns liquid petroleum gas is designed specifically for the construction industry. It can be moved around the job to warm workers, thaw out machinery, cure concrete, and dry plaster, mortar and other materials. Standard model includes burner control to turn off fuel should power fail or flow of gas be interrupted. Thermostats can be added where temperature control is desired. Stow Mfg. Co.



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CF&I-Clinton Welded Wire Fabric is ideal for reinforcing *all* types of concrete—both light and heavy construction. The wire mesh adds years of trouble-free life to the concrete because it helps cushion the shock of heavy loads, distributing the stress over a wide area. The steel reinforcing also minimizes cracking during the

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JOHN RUSKIN ON PRICES



JOHN RUSKIN
English critic and essayist
1819-1900

"The common law of business balance," John Ruskin once wrote,
prohibits paying a little and getting a lot."

This principle applies far more to ready mixed concrete than to any material manufactured today, for there are many fields in which one manufacturer may hold a significant price advantage because of his possession of a patent, a source of supply, or a production technique which is not available to his competitors.

But this just doesn't happen in the ready mix business, where all producers use pretty much the same basic raw materials, purchased from the same sources at about the same prices, and where manpower requirements and costs of processing and delivering the product inevitably show only the smallest variations from one efficiently operated plant to another.

The only elements left which can therefore account for sizable price differences in any specific market are things you just can't evaluate by testing cylinders. Things like dependable service and dedicated maintenance of the equipment which is so important for the delivery of a consistently high quality material, and the assurance that the delivered material is always backed by a sustained history of integrity and fair dealing.

John Ruskin also added this clincher to his statement concerning the common law of business: *"If you buy always at the lowest price it's well to add something for the risk you run. And if you do that, you will have enough to pay for something better."*

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